Filed July 27, 2022

On behalf of:
Patent Owner Masimo Corporation
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.

Petitioner,

v.

MASIMO CORPORATION,

Patent Owner.

IPR2021-00195
Patent 10,376,190

PATENT OWNER'S NOTICE OF APPEAL TO THE U.S. COURT OF APPEALS FOR THE FEDERAL CIRCUIT

Pursuant to 28 U.S.C. § 1295(a)(4)(A), 35 U.S.C. §§ 141(c), 142, and 319, 37 C.F.R. §§ 90.2(a) and 90.3, and Rule 4(a) of the Federal Rules of Appellate Procedure, Patent Owner Masimo Corporation ("Masimo") hereby appeals to the United States Court of Appeals for the Federal Circuit from the Judgment – Final Written Decision (Paper 32) entered on May 25, 2022 (Attachment A) and from all underlying orders, decisions, rulings, and opinions that are adverse to Masimo related thereto and included therein, including those within the Decision Granting Institution of *Inter Partes* Review, entered June 3, 2021 (Paper 7). Masimo appeals the Patent Trial and Appeal Board's determination that claims 1-14 and 16-30 of U.S. Patent 10,376,190 are unpatentable, and all other findings and determinations, including but not limited to claim construction, as well as all other issues decided adverse to Masimo's position or as to which Masimo is dissatisfied in IPR2021-00195 involving Patent 10,376,190.

Masimo is concurrently providing true and correct copies of this Notice of Appeal, along with the required fees, to the Director of the United States Patent and Trademark Office and the Clerk of the United States Court of Appeals for the Federal Circuit.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: July 27, 2022

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ATTACHMENT A

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571-272-7822

Paper 32
Entered: May 25, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

MASIMO CORPORATION,
Patent Owner.

IPR2021-00195
Patent 10,376,190 B1

Before JOSIAH C. COCKS, ROBERT L. KINDER, and AMANDA F. WIEKER, *Administrative Patent Judges.*

WIEKER, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background

Apple Inc. ("Petitioner") filed a Petition requesting an *inter partes* review of claims 1–14 and 16–30 ("challenged claims") of U.S. Patent No. 10,376,190 B1 (Ex. 1001, "the '190 patent"). Paper 2 ("Pet."). Masimo Corporation ("Patent Owner") waived filing a preliminary response. Paper 6. We instituted an *inter partes* review of all challenged claims 1–14 and 16–30 on all grounds of unpatentability, pursuant to 35 U.S.C. § 314. Paper 7 ("Inst. Dec.").

After institution, Patent Owner filed a Response (Paper 15, "PO Resp.") to the Petition, Petitioner filed a Reply (Paper 18, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 22, "PO Sur-reply"). An oral hearing was held on March 15, 2022, and a transcript of the hearing is included in the record. Paper 31 ("Tr.").

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, Petitioner has met its burden of showing, by a preponderance of the evidence, that challenged claims 1–14 and 16–30 of the '190 patent are unpatentable.

B. Related Matters

The parties identify the following matters related to the '190 patent:

Masimo Corporation v. Apple Inc., Civil Action No. 8:20-cv-00048 (C.D. Cal.) (filed Jan. 9, 2020);

Apple Inc. v. Masimo Corporation, IPR2020-01520 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,258,265 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01521 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,292,628 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01523 (PTAB Sept. 9, 2020) (challenging claims of U.S. Patent No. 8,457,703 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01524 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,433,776 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01526 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 6,771,994 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01536 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,588,553 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01537 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,588,553 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01538 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,588,554 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01539 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,588,554 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01713 (PTAB Sept. 30, 2020) (challenging claims of U.S. Patent No. 10,624,564 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01714 (PTAB Sept. 30, 2020) (challenging claims of U.S. Patent No. 10,631,765 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01715 (PTAB Sept. 30, 2020) (challenging claims of U.S. Patent No. 10,631,765 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01716 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,702,194 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01722 (PTAB Oct. 2, 2020) (challenging claims of U.S. Patent No. 10,470,695 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01723 (PTAB Oct. 2, 2020) (challenging claims of U.S. Patent No. 10,470,695 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01733 (PTAB Sept. 30, 2020) (challenging claims of U.S. Patent No. 10,702,195 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01737 (PTAB Sept. 30, 2020) (challenging claims of U.S. Patent No. 10,709,366 B1)

Apple Inc. v. Masimo Corporation, IPR2021-00193 (PTAB Nov. 20, 2020) (challenging claims of U.S. Patent No. 10,299,708 B1);

Apple Inc. v. Masimo Corporation, IPR2021-00208 (PTAB Nov. 20, 2020) (challenging claims of U.S. Patent No. 10,258,266 B1); and

Apple Inc. v. Masimo Corporation, IPR2021-00209 (PTAB Nov. 20, 2020) (challenging claims of U.S. Patent No. 10,376,191 B1).

Pet. 100; Paper 3, 3–4.

Patent Owner further identifies the following pending patent applications, among other issued and abandoned applications, that claim priority to, or share a priority claim with, the ’190 patent:

U.S. Patent Application No. 16/834,538;

U.S. Patent Application No. 17/031,407;

U.S. Patent Application No. 17/031,316;

U.S. Patent Application No. 17/031,356;

U.S. Patent Application No. 16/449,143; and

U.S. Patent Application No. 16/805,605.

Paper 3, 1–3.

C. The ’190 Patent

The ’190 patent is titled “Multi-Stream Data Collection System for Noninvasive Measurement of Blood Constituents,” and issued on August 13,

2019, from U.S. Patent Application No. 16/409,304, filed May 10, 2019. Ex. 1001, codes (21), (22), (45), (54). The '190 patent claims priority through a series of continuation and continuation-in-part applications to Provisional Application Nos. 61/078,228 and 61/078,207, both filed July 3, 2008. *Id.* at codes (60), (63).

The '190 patent discloses a two-part data collection system including a noninvasive sensor that communicates with a patient monitor. *Id.* at 2:31–33. The sensor includes a sensor housing, an optical source, and several photodetectors, and is used to measure a blood constituent or analyte, e.g., oxygen or glucose. *Id.* at 2:22–28, 57–58. The patient monitor includes a display and a network interface for communicating with a handheld computing device. *Id.* at 2:38–40.

Figure 1 of the '190 patent is reproduced below.

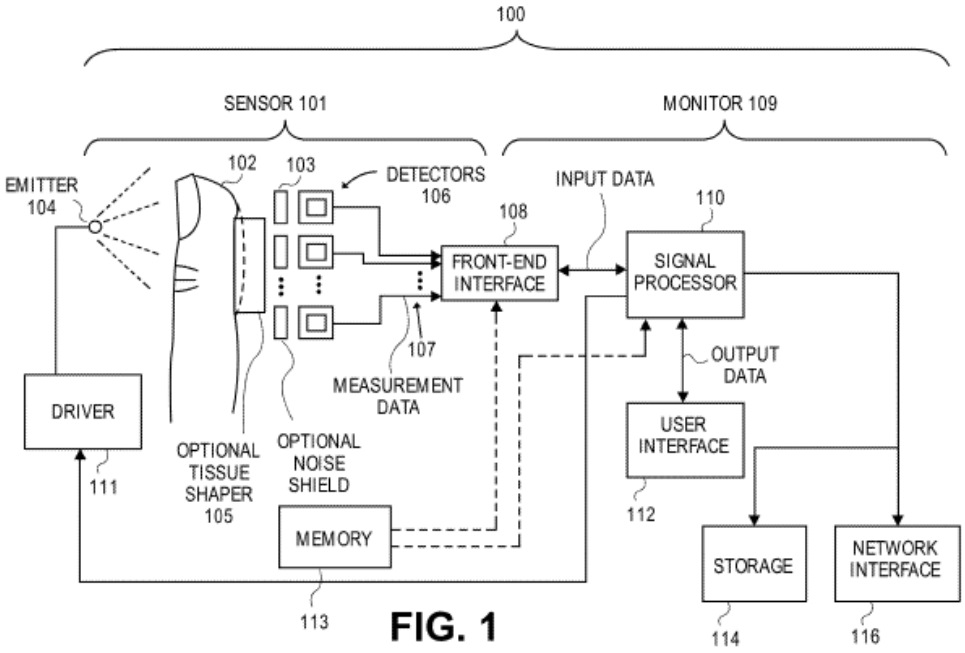


FIG. 1

Figure 1 illustrates a block diagram of data collection system 100 including sensor 101 and monitor 109. *Id.* at 11:36–47. Sensor 101 includes optical emitter 104 and detectors 106. *Id.* at 11:48–52. Emitters 104 emit light that

is attenuated or reflected by the patient's tissue at measurement site 102. *Id.* at 13:60–67. Detectors 106 capture and measure the light attenuated or reflected from the tissue. *Id.* In response to the measured light, detectors 106 output detector signals 107 to monitor 109 through front-end interface 108. *Id.* at 13:64–66, 14:16–22. Sensor 101 also may include tissue shaper 105, which may be in the form of a convex surface that: (1) reduces the thickness of the patient's measurement site; and (2) provides more surface area from which light can be detected. *Id.* at 10:61–11:3.

Monitor 109 includes signal processor 110 and user interface 112. *Id.* at 15:6–8. "[S]ignal processor 110 includes processing logic that determines measurements for desired analytes . . . based on the signals received from the detectors 106." *Id.* at 15:10–14. User interface 112 presents the measurements to a user on a display, e.g., a touch-screen display. *Id.* at 15:38–48. The monitor may be connected to storage device 114 and network interface 116. *Id.* at 15:52–16:3.

The '190 patent describes various examples of sensor devices. Figures 14D and 14F, reproduced below, illustrate detector portions of sensor devices.

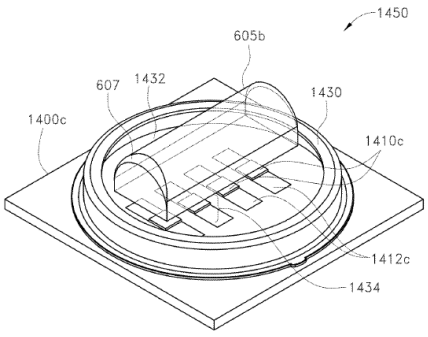


FIG. 14D

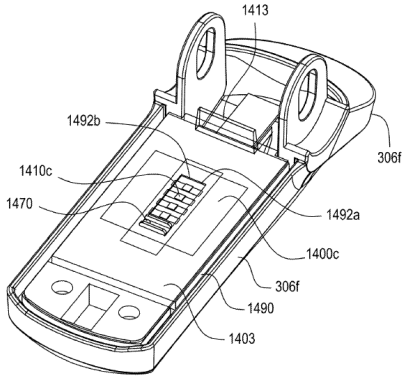


FIG. 14F

Figure 14D illustrates portions of a detector submount and Figure 14F illustrates portions of a detector shell. *Id.* at 6:34–37. As shown in

Figure 14D, multiple detectors 1410c are located within housing 1430 and under transparent cover 1432, on which protrusion 605b (or partially cylindrical protrusion 605) is disposed. *Id.* at 35:23–25, 36:17–24. Figure 14F illustrates detector shell 306f including detectors 1410c on substrate 1400c. *Id.* at 36:63–37:4. Substrate 1400c is enclosed by shielding enclosure 1490 and noise shield 1403, which include window 1492a and window 1492b, respectively, placed above detectors 1410c. *Id.* Alternatively, cylindrical housing 1430 may be disposed under noise shield 1403 and may enclose detectors 1410c. *Id.* at 37:34–36.

Figures 4A and 4B, reproduced below, illustrate an alternative example of a tissue contact area of a sensor device.

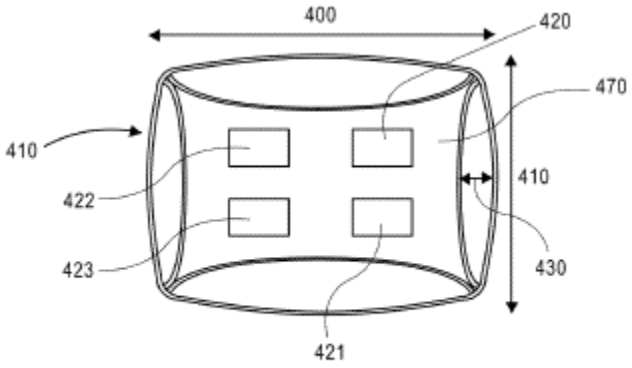


FIG. 4A

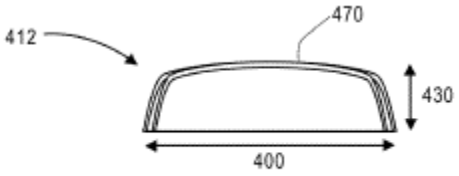


FIG. 4B

Figures 4A and 4B illustrate arrangements of protrusion 405 including measurement contact area 470. *Id.* at 23:8–14. "[M]easurement site contact area 470 can include a surface that molds body tissue of a measurement site." *Id.* "For example, . . . measurement site contact area 470 can be generally curved and/or convex with respect to the measurement site." *Id.* at 23:31–33. The measurement site contact area may include windows 420–423 that "mimic or approximately mimic a configuration of, or even house, a plurality of detectors." *Id.* at 23:39–53.

D. Illustrative Claim

Of the challenged claims, claims 1 and 26 are independent. Claim 1 is illustrative and is reproduced below.

> 1. A noninvasive optical physiological measurement device adapted to be worn by a wearer, the noninvasive optical physiological measurement device providing an indication of a physiological parameter of the wearer comprising:
>
> [a] one or more light emitters;
>
> [b] a housing having a surface and a circular raised edge extending from the surface;
>
> [c] at least four detectors arranged on the surface and spaced apart from each other, the at least four detectors configured to output one or more signals responsive to light from the one or more light emitters attenuated by body tissue, the one or more signals indicative of a physiological parameter of the wearer; and
>
> [d] a light permeable cover arranged above at least a portion of the housing, the light permeable cover comprising a protrusion arranged to cover the at least four detectors.

Ex. 1001, 44:37–53 (bracketed identifiers [a]–[d] added). Independent claim 26 includes limitations substantially similar to limitations [a]–[d] of claim 1. *Id.* at 46:22–40 (reciting a "circular housing" with a "wall"; reciting a "lens portion").

E. Applied References

Petitioner relies upon the following references:

> Beyer, Jr., U.S. Patent No. 7,031,728 B2, filed Sept. 21, 2004, issued Apr. 18, 2006 (Ex. 1019, "Beyer");
>
> Ohsaki et al., U.S. Patent Application Publication No. 2001/0056243 A1, filed May 11, 2001, published December 27, 2001 (Ex. 1014, "Ohsaki");

Aizawa, U.S. Patent Application Publication No. 2002/0188210 A1, filed May 23, 2002, published December 12, 2002 (Ex. 1006, "Aizawa");

Lo et al., U.S. Patent Application Publication No. 2004/0138568 A1, filed Jan. 15, 2003, published July 15, 2004 (Ex. 1028, "Lo");

Inokawa et al., Japanese Patent Application Publication No. 2006-296564 A, filed April 18, 2005, published November 2, 2006 (Ex. 1007, "Inokawa");[1]

Goldsmith et al., U.S. Patent Application Publication No. 2007/0093786 A1, filed July 31, 2006, published April 26, 2007 (Ex. 1027, "Goldsmith");

Al-Ali et al., U.S. Patent Application Publication No. 2008/0242958 A1, filed Mar. 26, 2008, published Oct. 2, 2008 (Ex. 1030, "Al-Ali");

Y. Mendelson et al., "Design and Evaluation of a New Reflectance Pulse Oximeter Sensor," Association for the Advancement of Medical Instrumentation, Vol. 22, No. 4, 167–173 (1988) (Ex. 1015, "Mendelson-1988"); and

Y. Mendelson et al., "A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring," Proceedings of the 28th IEEE EMBS Annual International Conference, 912–915 (2006) (Ex. 1016, "Mendelson-2006").

Pet. 4. Petitioner also submits, *inter alia*, the Declaration of Thomas W. Kenny, Ph.D. (Ex. 1003), and the Second Declaration of Thomas W. Kenny (Ex. 1047). Patent Owner submits, *inter alia*, the Declaration of Vijay K. Madisetti, Ph.D. (Ex. 2004). The parties also provide deposition testimony from Dr. Kenny and Dr. Madisetti, including from this and other proceedings. *See* Exs. 1034–1036, 2006–2009, 2027.

[1] Petitioner relies on a certified English translation of Inokawa (Ex. 1008). In this Decision, we also refer to the translation.

F. Asserted Grounds

Petitioner asserts that claims 1–14 and 16–30 are unpatentable based upon the following grounds (Pet. 1–2):

Claim(s) Challenged	35 U.S.C. §	References/Basis
1–14, 16, 17, 19–23, 26–29	103	Aizawa, Inokawa
1–14, 16, 17, 19–23, 26–29	103	Aizawa, Inokawa, Ohsaki
23, 24	103	Aizawa, Inokawa, Mendelson-2006
23–25	103	Aizawa, Inokawa, Goldsmith, Lo
25	103	Aizawa, Inokawa, Mendelson-2006, Beyer
5	103	Aizawa, Inokawa, Al-Ali
1–14, 16–22, 26–30	103	Mendelson-1988, Inokawa
23, 24	103	Mendelson-1988, Inokawa, Mendelson-2006
25	103	Mendelson-1988, Inokawa, Mendelson-2006, Beyer

II. DISCUSSION

A. Claim Construction

For petitions filed on or after November 13, 2018, a claim shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b) (2019).

Although both parties contend that no claim term requires express construction (Pet. 4–5; PO Resp. 10), the substance of the parties' briefing demonstrates that there is a dispute regarding the claim term "cover."

1. "cover"

Each of independent claims 1 and 26 requires "a light permeable cover." Ex. 1001, 44:51, 46:33.

Patent Owner argues that the claimed "cover" excludes "an optically clear adhesive/epoxy" and a "resin on a surface." PO Resp. 46–47. According to Patent Owner, "the '190 Patent distinguishes a resin on a surface from a cover, explaining: 'the cylindrical housing 1430 (and transparent cover 1432) . . . can protect the detectors 1410c and conductors 1412c ***more effectively*** than currently-available ***resin epoxies***.'" *Id.* at 47 (quoting Ex. 1001, 36:37–46).

Patent Owner alleges that Dr. Kenny also "distinguished a sealing resin from a cover, acknowledging a 'layer of sealing resin' is 'one way to protect the components ***without using a cover***.'" *Id.* (quoting Ex. 2009, 395:22–396:17). Patent Owner argues its understanding is consistent with the prior art cited by Petitioner. *Id.* (citing Ex. 1008 ¶ 103, Fig. 17; Ex. 1023 ¶ 35; Ex. 1012, 5:2–6, Fig. 2B; Ex. 1013 ¶ 32, Fig. 2; Ex. 1027 ¶ 85, Fig. 9B Ex. 2004 ¶ 104).

Petitioner replies that "there is nothing in the specification or the prosecution history [of the '190 patent] that would lead a [person of ordinary skill in the art] to conclude that 'cover' should be interpreted based on anything other than its plain meaning." Pet. Reply 20 (citing *Thorner v. Sony Computer Entertainment America LLC*, 669 F.3d 1362, 1368 (Fed. Cir. 2012)). That plain meaning, according to Petitioner, is that "a cover is merely 'something that protects, shelters, or guards.'" *Id.* at 20–21 (quoting Ex. 1050; citing Pet. 73–75; Ex. 1047 ¶ 43). Petitioner argues that Patent Owner's reliance on the '190 patent Specification takes text out of context

and, when context is considered, it is clear that "the epoxy resin to which the '190 patent compares its cover is not [an] epoxy cover . . . but rather epoxy that is applied to solder joints." *Id.* at 21 (citing Ex. 1001, 36:37–46; Ex. 1047 ¶ 45).

Petitioner also contends that Patent Owner "mischaracterizes Dr. Kenny's deposition testimony to say he agreed that 'sealing resin' is somehow distinguished from a cover." *Id*. Petitioner contends that Dr. Kenny simply "clarified that using a sealing resin is 'a pretty common way to protect electronic components.'" *Id.* (citing Ex. 2009, 395:22–396:17; Ex. 1047 ¶ 44). Moreover, Petitioner contends that "such extrinsic evidence would not justify departure from plain meaning under *Thorner*." *Id.*

In its Sur-reply, Patent Owner maintains that the '190 patent "specifically ***distinguishes*** a 'resin' on a surface from a 'cover,'" and Petitioner's opposing reading is not persuasive. PO Sur-reply 18–19.

Upon review of the record, we disagree with Patent Owner's limiting construction of "cover" to exclude epoxy and resin. The plain and ordinary meaning of the term does not support Patent Owner's view. A "cover" ordinarily connotes "something that protects, shelters, or guards." Ex. 1050 (*Merriam-Webster's Collegiate Dictionary*, 11th ed. (©2005)), 288. That plain and ordinary meaning is consistent with the '190 patent's description of "flex circuit cover 360, which can be made of plastic or another suitable material . . . [and] can cover and thereby protect a flex circuit (not shown)." Ex. 1001, 22:62–66. It is also consistent with the '190 patent's description and illustration of "transparent cover 1432" in Figure 14D, which covers and protects detectors 1410c and conductors 1412c, and which "can be

fabricated from glass or plastic, *among other materials*." *See id.* at 36:22–36 (emphasis added), Figs. 14D–14E.

This is not the situation in which a special definition for a claim term has been set forth in the specification with reasonable clarity, deliberateness, and precision, so as to give notice of the inventor's own lexicography. *See Merck & Co. v. Teva Pharms. USA, Inc.*, 395 F.3d 1364, 1370 (Fed. Cir. 2005); *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Nor do we discern that Patent Owner "demonstrate[d] an intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope." *Teleflex, Inc. v. Ficosa North America Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002).

Here, based upon our review of the intrinsic evidence, no such special definition or express disavowal of the term "cover" to exclude epoxy and resin exists. Patent Owner relies on the following description of Figure 14D in that regard:

> *In certain embodiments, the cylindrical housing 1430 (and transparent cover 1432)* forms an airtight or substantially airtight or hermetic seal with the submount 1400c. As a result, the cylindrical housing 1430 can protect the detectors 1410c and conductors 1412c from fluids and vapors that can cause corrosion. Advantageously, *in certain embodiments, the cylindrical housing 1430 can protect* the detectors 1410c and conductors 1412c *more effectively than currently-available resin epoxies*, which are sometimes applied to solder joints between conductors and detectors.

Ex. 1001, 36:37–46 (emphases added). First, the sentence cited by Patent Owner begins with the phrase "[i]n certain embodiments," which indicates the claimed invention is not limited and is open to other embodiments, so there is no lexicography or disavowal here. Second, we agree with

Petitioner's reading of this passage as distinguishing the prior art from the claimed invention based on the *location* of the material (applied only to solder joints between conductors and detectors in the prior art, as opposed to covering the conductors and detectors in the invention) and not the *type* of material. Third, at best, the '190 patent expresses a preference for a cover to be made of glass or plastic, because such materials provide "more effective[]" protection than resin epoxies that were known when the '190 patent was filed. *See id.* at 36:42–46. But even this reading recognizes that resin epoxies provide some amount of protection, albeit perhaps a lesser amount than glass or plastic, and are not excluded from forming the material of a cover.

Dr. Kenny's deposition testimony cited by Patent Owner also does not persuade us that, in the context of the '190 patent, epoxy or resin is excluded from the material of a cover. Dr. Kenny testifies that "a layer of sealing resin" "[c]ould" be used to protect the electronic components in a sensor (Ex. 2009, 395:22–396:8). He was then asked "So that would be one way to protect the components without using a cover, correct?" to which he answered "[t]here are many ways to protect the elements other than using a cover" and maintained that the proposed combination of prior art has a "cover" to achieve purposes *other than* protecting electronic components, i.e., "to improve adhesion and to improve light gathering for the operation of the system." *Id.* at 396:9–17. He did not squarely testify that sealing resin may never be a cover.

Accordingly, in the context of the '190 patent, we do not construe the claimed "cover" to exclude epoxy and resin.

2. Other Claim Terms

Upon consideration of the entirety of the arguments and evidence presented, we conclude no further explicit construction of any claim term is needed to resolve the issues presented by the arguments and evidence of record. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Matal*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (per curiam) (claim terms need to be construed "only to the extent necessary to resolve the controversy" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

B. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of non-obviousness.[2] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also "determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of prior art

[2] Patent Owner does not present objective evidence of non-obviousness.

elements would have produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

Petitioner identifies the appropriate level of skill in the art as that possessed by a person having "a Bachelor of Science degree in an academic discipline emphasizing the design of electrical, computer, or software technologies, in combination with training or at least one to two years of related work experience with capture and processing of data or information." Pet. 5 (citing Ex. 1003 ¶¶ 21–22). "Alternatively, the person could have also had a Master of Science degree in a relevant academic discipline with less than a year of related work experience in the same discipline." *Id.*

Patent Owner makes several observations regarding Petitioner's identified level of skill in the art but, "[f]or this proceeding, [Patent Owner] nonetheless applies Petitioner's asserted level of skill." PO Resp. 10–11 (citing Ex. 2004 ¶¶ 35–38).

We adopt Petitioner's assessment as set forth above, which appears consistent with the level of skill reflected in the Specification and prior art.

D. Obviousness over the Combined Teachings of Aizawa and Inokawa

Petitioner contends that claims 1–14, 16, 17, 19–23, and 26–29 of the '190 patent would have been obvious over the combined teachings of Aizawa and Inokawa. Pet. 8–42.

1. Overview of Aizawa (Ex. 1006)

Aizawa is a U.S. patent application publication titled "Pulse Wave Sensor and Pulse Rate Detector," and discloses a pulse wave sensor that detects light output from a light emitting diode and reflected from a patient's artery. Ex. 1006, codes (54), (57).

Figure 1(a) of Aizawa is reproduced below.

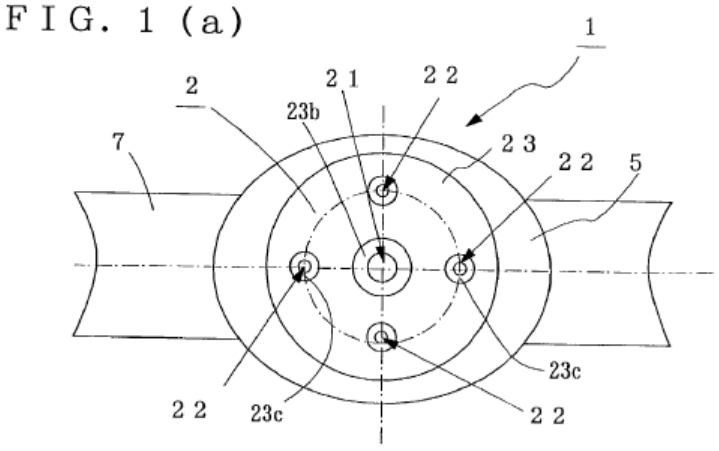


Figure 1(a) is a plan view of a pulse wave sensor. *Id.* ¶ 23. As shown in Figure 1(a), pulse wave sensor 2 includes light emitting diode ("LED") 21, four photodetectors 22 symmetrically disposed around LED 21, and holder 23 for storing LED 21 and photodetectors 22. *Id.* Aizawa discloses that, "to further improve detection efficiency, . . . the number of the photodetectors 22 may be increased." *Id.* ¶ 32, Fig. 4(a). "The same effect can be obtained when the number of photodetectors 22 is [one] and a

plurality of light emitting diodes 21 are disposed around the photodetector 22." *Id.* ¶ 33.

Figure 1(b) of Aizawa is reproduced below.

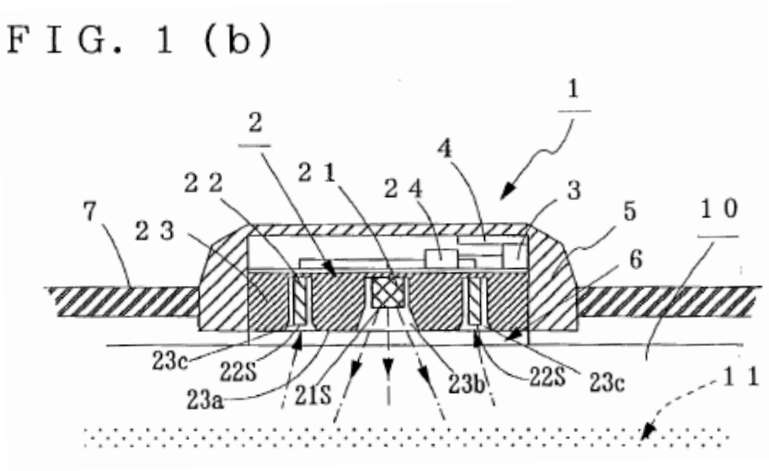


Figure 1(b) is a sectional view of the pulse wave sensor. *Id.* ¶ 23. As shown in Figure 1(b), pulse wave sensor 2 includes drive detection circuit 24 for detecting a pulse wave by amplifying the outputs of photodetectors 22. *Id.* ¶ 23. Arithmetic circuit 3 computes a pulse rate from the detected pulse wave and transmitter 4 transmits the pulse rate data to an "unshown display." *Id.* The pulse rate detector further includes outer casing 5 for storing pulse wave sensor 2, acrylic transparent plate 6 mounted to detection face 23a of holder 23, and attachment belt 7. *Id.* ¶ 23.

Aizawa discloses that LED 21 and photodetectors 22 "are stored in cavities 23b and 23c formed in the detection face 23a" of the pulse wave sensor. *Id.* ¶ 24. Detection face 23a "is a contact side between the holder 23 and a wrist 10, respectively, at positions where the light emitting face 21s of the light emitting diode 21 and the light receiving faces 22s of the photodetectors 22 are set back from the above detection face 23a." *Id.* ¶ 24. Aizawa discloses that "a subject carries the above pulse rate detector 1 on the inner side of his/her wrist 10 . . . in such a manner that the light emitting

face 21s of the light emitting diode 21 faces down (on the wrist 10 side)." *Id.* ¶ 26. Furthermore, "the above belt 7 is fastened such that the acrylic transparent plate 6 becomes close to the artery 11 of the wrist 10. Thereby, adhesion between the wrist 10 and the pulse rate detector 1 is improved." *Id.* ¶¶ 26, 34.

2. Overview of Inokawa (Ex. 1008)

Inokawa is a Japanese published patent application titled "Optical Vital Sensor, Base Device, Vital Sign Information Gathering System, and Sensor Communication Method," and discloses a pulse sensor device. Ex. 1008 ¶ 6.

Figure 1 of Inokawa is reproduced below.

(FIG. 1)

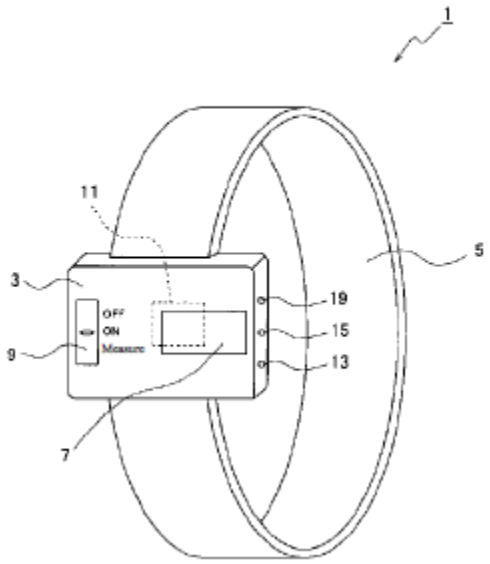


Figure 1 illustrates a schematic view of a pulse sensor. *Id.* ¶ 56. Pulse sensor 1 includes box-shaped sensor unit 3 and flexible annular wristband 5. *Id.* ¶ 57. Sensor unit 3 includes a top surface with display 7 and control switch 9, and a rear surface (sensor-side) with optical device component 11 for optically sensing a user's pulse. *Id.*

Figure 2 of Inokawa is reproduced below.

(FIG. 2)

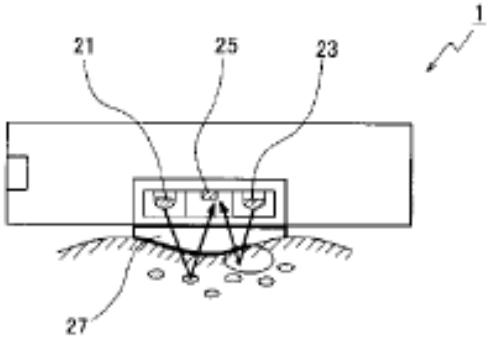


Figure 2 illustrates a schematic view of the rear surface of the pulse sensor. *Id.* ¶ 58. The rear-side (sensor-side) of pulse sensor 1 includes a pair of light-emitting elements, i.e., green LED 21 and infrared LED 23, as well as photodiode 25 and lens 27. *Id.* In various embodiments, Inokawa discloses that the sensor-side lens is convex. *See id.* ¶¶ 99, 107. Green LED 21 senses "the pulse from the light reflected off of the body (i.e.[,] change in the amount of hemoglobin in the capillary artery)," and infrared LED 23 senses body motion from the change in reflected light. *Id.* ¶ 59. The pulse sensor stores this information in memory. *Id.* ¶ 68. To read and store information, the pulse sensor includes a CPU that "performs the processing to sense pulse, body motion, etc. from the signal . . . and temporarily stores the analysis data in the memory 63." *Id.* ¶ 69.

Figure 3 of Inokawa is reproduced below.

(FIG. 3)

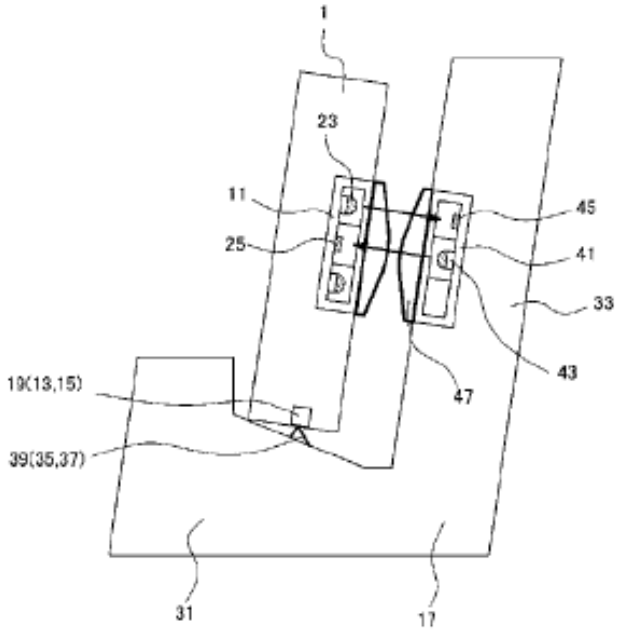


Figure 3 illustrates a schematic view of a pulse sensor mounted to a base device. *Id.* ¶ 60. Pulse sensor 1 is depicted as mounted to base device 17, which "is a charger with communication functionality." *Id.* When so mounted, sensor optical device component 11 and base optical device component 41 face each other in close proximity. *Id.* ¶ 66. In this position, pulse sensor 1 can output information to the base device through the coupled optical device components. *Id.* ¶ 67. Specifically, the pulse sensor CPU performs the controls necessary to transmit pulse information using infrared LED 23 to photodetector 45 of base device 17. *Id.* ¶¶ 67, 70, 76. In an alternative embodiment, additional sensor LEDs and base photodetectors can be used to efficiently transmit data and improve accuracy. *Id.* ¶ 111.

3. Independent Claim 1

Petitioner contends that claim 1 would have been obvious over the combined teachings of Aizawa and Inokawa. Pet. 13–17 (combination), 17–23 (claim 1).

i. "A noninvasive optical physiological measurement device adapted to be worn by a wearer, the noninvasive optical physiological measurement device providing an indication of a physiological parameter of the wearer comprising"

The cited evidence supports Petitioner's undisputed contention that Aizawa discloses a noninvasive optical physiological measurement device, i.e., a pulse sensor worn on a wearer's wrist, that indicates a physiological parameter of the wearer. Pet. 17; *see, e.g.*, Ex. 1006 ¶ 2 ("[A] pulse wave sensor for detecting the pulse wave of a subject from light reflected from a red corpuscle in the artery of a wrist of the subject by irradiating the artery of the wrist with light.").

ii. "[a] one or more light emitters"

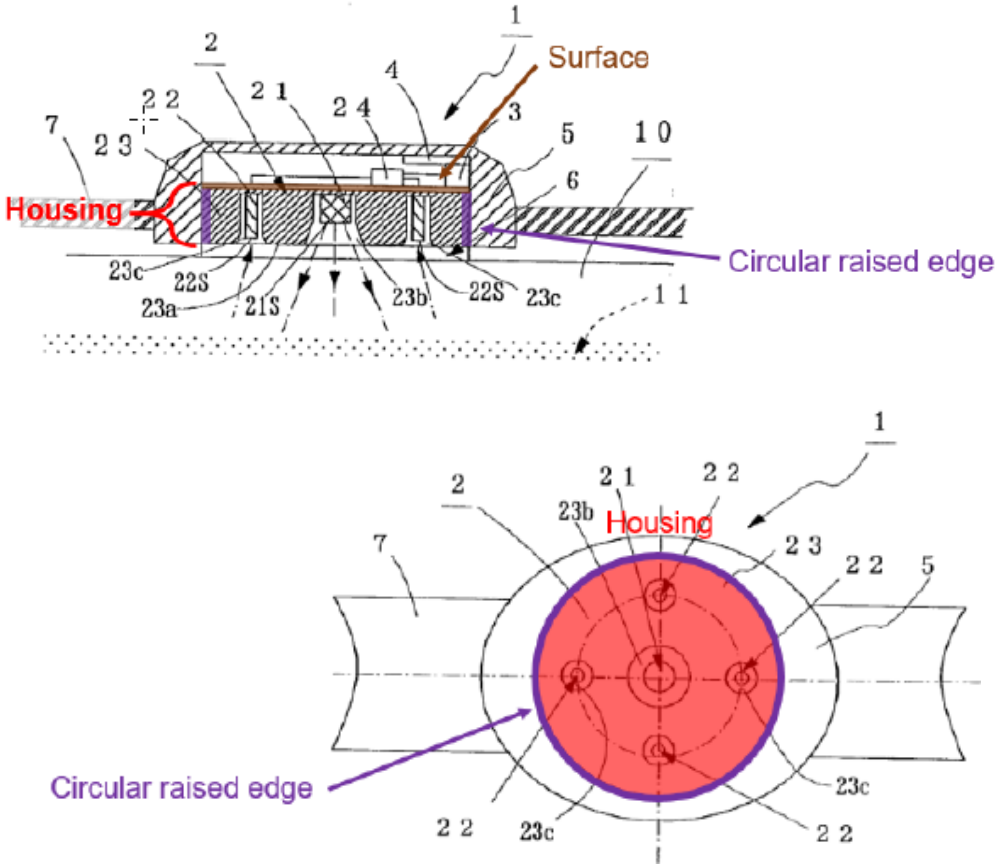
The cited evidence supports Petitioner's undisputed contention that Aizawa discloses LED 21 that emits light. Pet. 17–18; *see, e.g.*, Ex. 1006 ¶ 23 ("LED 21 . . . for emitting light having a wavelength of a near infrared range"), Figs. 1(a)–(b).

iii. "[b] a housing having a surface and a circular raised edge extending from the surface"

The cited evidence supports Petitioner's undisputed contention that Aizawa discloses holder 23, which includes a flat surface and a circular raised edge extending from the surface. Pet. 18–19; *see, e.g.*, Ex. 1006 ¶ 23

("holder 23 for storing . . . light emitting diode 21 and the photodetectors 22"), Figs. 1(a)–(b) (depicting holder 23 surrounding each detector 22); Ex. 1003 ¶¶ 75–76.

Petitioner's annotated versions of Aizawa's Figures 1(a) and 1(b) are reproduced below.



Pet. 18–19. The modified figures depict side and top views of Aizawa's sensor with the housing identified in red shading, the circular raised edge identified in purple, and the surface depicted in brown. *Id.*

iv. "[c] at least four detectors arranged on the surface and spaced apart from each other, the at least four detectors configured to output one or more signals responsive to light from the one or more light emitters attenuated by body tissue, the one or more signals indicative of a physiological parameter of the wearer"

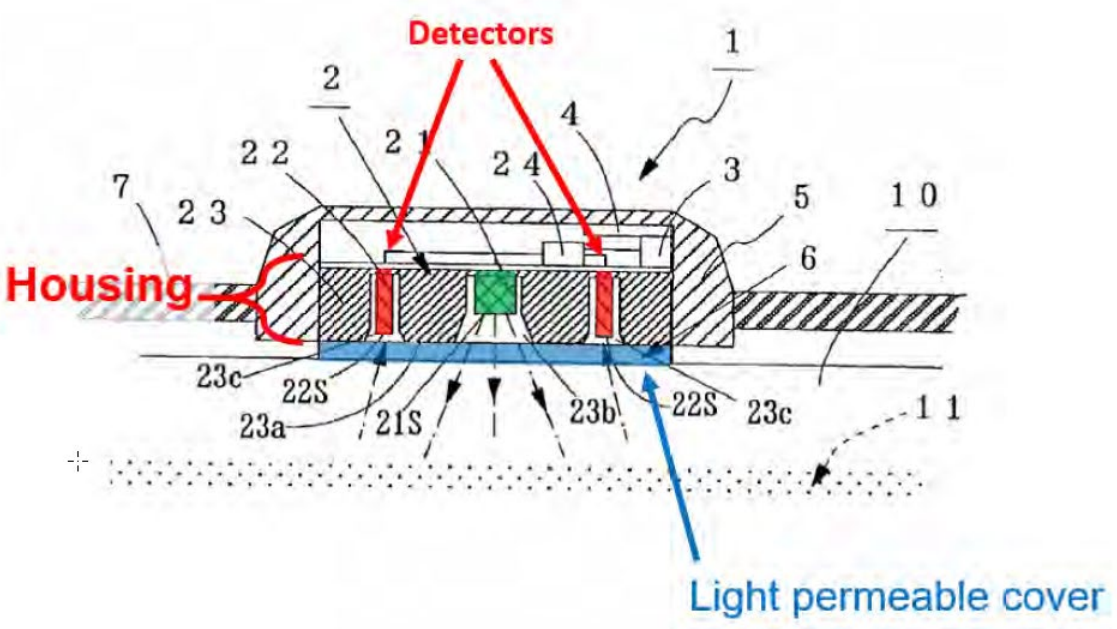
The cited evidence supports Petitioner's undisputed contention that Aizawa discloses at least four detectors 22 that are spaced apart on the surface, wherein the detectors output one or more signals indicative of a physiological parameter of the wearer, e.g., pulse, in response to light emitted by LED 21 that is attenuated by body tissue. Pet. 19–21; *see, e.g.*, Ex. 1006, Fig. 1(a) (depicting detectors 22 spaced apart around LED 21), ¶¶ 23 ("drive detection circuit 24 for detecting a pulse wave by amplifying the outputs of the photodetectors 22"), 27 ("Near infrared radiation output toward the wrist 10 from the light emitting diode 21 is reflected by a red corpuscle running through the artery 11 of the wrist 10 and this reflected light is detected by the plurality of photodetectors 22 so as to detect a pulse wave."), 28 ("[T]he amplified output is converted into a digital signal for the computation of a pulse rate."); Ex. 1003 ¶¶ 77–79.

v. "[d] a light permeable cover arranged above at least a portion of the housing, the light permeable cover comprising a protrusion arranged to cover the at least four detectors."

Petitioner's Contentions

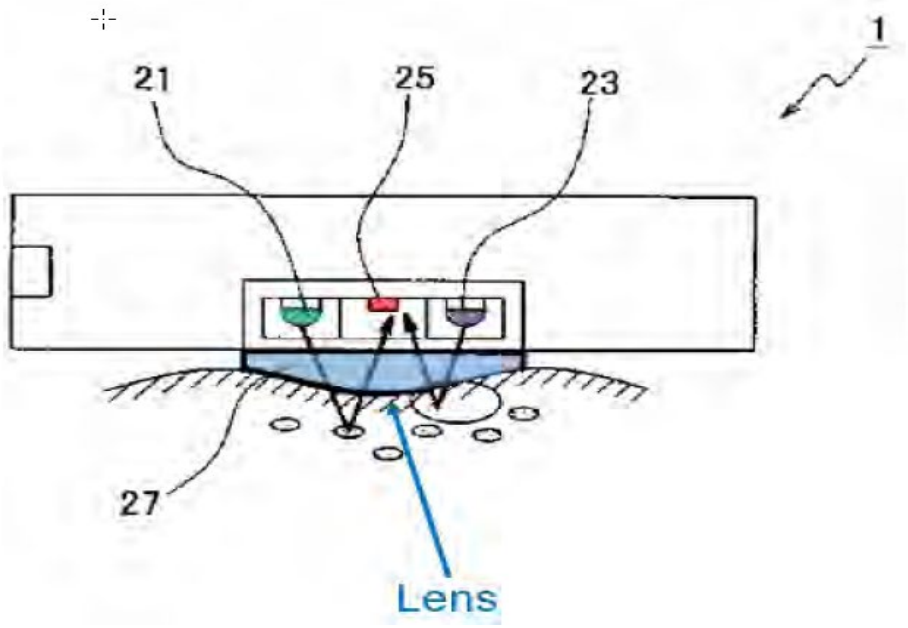
With reference to an annotated version of Aizawa's Figure 1(b) (reproduced below), Petitioner contends that "Aizawa teaches a light permeable cover in the form of an acrylic transparent plate 6 (blue) that is

mounted at the detection face 23a over at least a portion of the housing to cover the at least four detectors (red)." Pet. 22.



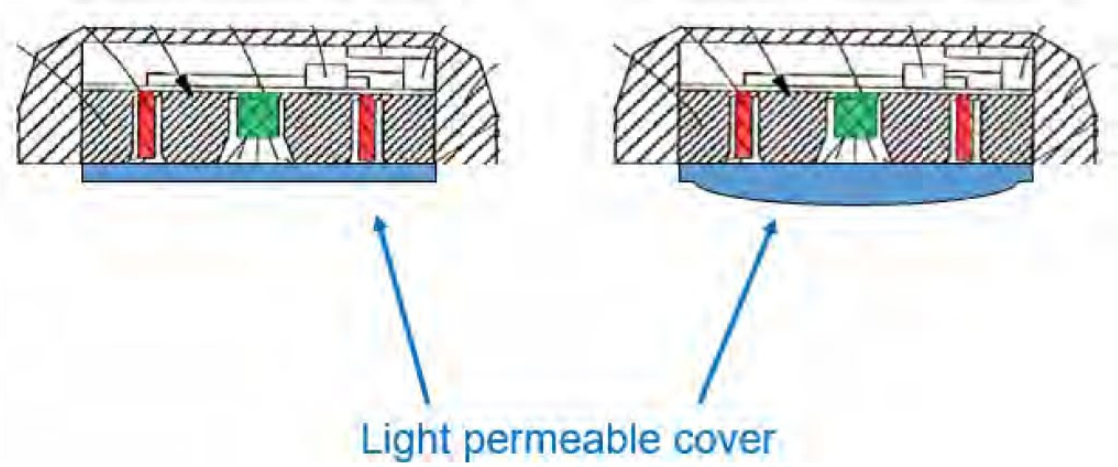
The figure above shows Petitioner's annotated version of Aizawa's Figure 1(b), in which transparent plate 6 is shaded in blue and identified as "Light permeable cover." Petitioner contends that beyond disclosing that the acrylic transparent "helps [to] improve 'detection efficiency,' Aizawa does not provide much other detail, for instance regarding its shape." *Id.* at 13 (citing Ex. 1006 ¶ 30).

Petitioner reasons, however, that one of ordinary skill in the art would have "looked to Inokawa to enhance light collection efficiency, specifically by modifying the light permeable cover of Aizawa to include a convex protrusion that acts as a lens." *Id.* at 14. In that regard, Petitioner points to Inokawa's Figure 2. Petitioner's annotated version of that figure is reproduced below.



Id. Figure 2 above depicts Inokawa's lens 27 shaded in blue. Petitioner expresses that "Inokawa teaches that its cover may be either flat . . . such that 'the surface is less prone to scratches'" or may be in the form of the lens shape shown above to "increase the light-gathering ability of the LED." *Id.* at 15 (quoting Ex. 1008 ¶ 15); *see* Ex. 1003 ¶¶ 83–87. Petitioner contends that a person of ordinary skill in the art "making the design choice to prioritize improved light collection efficiency over reduced suseptibility to scratches could have readily modified Aizawa's cover to include a lens as per Inokawa." Pet. 16 (citing Ex. 1003 ¶ 99). Petitioner also contends that a skilled artisan would have had a reasonable expectation of success in combining those teachings. *Id.* at 15 (citing Ex. 1003 ¶ 86). Petitioner adds that Aizawa's "transparent acrylic material . . . can be readily formed into a lens structure as in Inokawa." *Id.* at 16 (citing Ex. 1003 ¶ 87; Ex. 1009, 3:46–51, Fig. 1; Ex. 1023, Fig. 6, ¶¶ 22, 32, 35).

Petitioner provides annotated and modified versions of Aizawa's Figure 1(b) that depict the proposed combination, which are reproduced below. *Id.* at 15 (citing Ex. 1003 ¶ 85).



Petitioner's annotated figure on the left depicts Aizawa's device with its flat cover, and the annotated and modified figure on the right depicts the device resulting from the combination of Aizawa and Inokawa, in which a person of ordinary skill in the art would have replaced Aizawa's flat cover with a cover comprising a protrusion to "increase the light-gathering ability." *Id.* (quoting Ex. 1008 ¶ 15).

According to Petitioner, a person of ordinary skill in the art "would have understood how to implement Inokawa's lens in Aizawa's device with a reasonable expectation of success." Pet. 15–16 (citing Ex. 1008, Figs. 16, 17, ¶¶ 15, 106); Ex. 1003 ¶ 86. The shape of the modified cover in Dr. Kenny's illustration of the proposed modification above is similar to the shape of an LED lens illustrated in Exhibit 1023 (hereafter "Nishikawa"),[3] referenced by Petitioner and Dr. Kenny in connection with the proposed

[3] U.S. Patent Application Publication No. 2007/0145255 A1, filed Dec. 20, 2006, published June 28, 2007 (Ex. 1023).

ground of unpatentability. *Compare* Pet. 15 (illustrating proposed modification), *with* Ex. 1023, Fig. 6, ¶¶ 3, 22, 30, 32, 35 (illustrating lens 50 used with LED 22, and discussing how to make the illustrated device).

Patent Owner's Arguments

Patent Owner contends that the evidence does not support Petitioner's contention that it would have been obvious to modify Aizawa's cover to have a convex protrusion, in order to improve detection efficiency by directing incoming light to Aizawa's photodetectors 22, with a reasonable expectation of success. PO Resp. 12–37; PO Sur-reply 1–13; Ex. 2004 ¶¶ 48–78.

According to Patent Owner, the evidence establishes that Petitioner's proposed modification would direct light *toward the center* of Aizawa's detector 1 where emitter 21 is located, rather than *toward the periphery* where detectors 22 are located. PO Resp. 16–24; Ex. 2004 ¶¶ 50–65. Thus, Patent Owner's view is that a person of ordinary skill in the art "would ***not*** have expected Inokawa's protruding surface to accomplish" the objective of enhancing light collection efficiency relied upon by Petitioner, because Petitioner's proposed modification instead "would direct light ***away*** from the ***periphery***-located detectors" in Aizawa, the opposite result to Petitioner's contention. PO Resp. 20; Ex. 2004 ¶¶ 42–43, 48–57.

In support, Patent Owner points to Inokawa's Figure 2, in which two arrows illustrate light that passes through the convex protrusion of lens 27 toward the center of Inokawa's pulse sensor 1 where detector 25 is located. PO Resp. 14 (citing Ex. 1008 ¶ 58), 18; Ex. 2004 ¶¶ 42–43. Patent Owner also points to the '190 patent's Figure 14B, which illustrates several light rays 1420, 1422 passing through a partially cylindrical protrusion 605 to be

centrally focused on detector(s) 1410B. PO Resp. 19 (citing Ex. 1001, 35:67–36:2, 36:56–60; Ex. 2004 ¶¶ 53–55). Patent Owner cites portions of Dr. Kenny's deposition testimony that, in Patent Owner's view, support Patent Owner's contentions in these regards. *See* PO Resp. 2, 17–18 (citing Ex. 2006, 83:15–84:2, 86:19–87:1, 202:11–204:20).

Patent Owner also asserts that "Dr. Kenny admitted that the impact of Inokawa's convex lens would not be 'obvious' in the context of [the] different configuration of LEDs and detectors" presented by Aizawa. PO Resp. 20–21 (citing Ex. 2006, 87:2–6). For example, Patent Owner points out that "light reaching Aizawa's detectors must travel in an opposite direction from the light in Inokawa." *Id.* at 21–22 (citing Ex. 1006, Fig. 1(b); Ex. 1008, Fig. 2); Ex. 2004 ¶¶ 61–64. In addition, according to Patent Owner, "Petitioner's combination is particularly problematic because" Aizawa uses "small detectors [22] with small openings [of cavities 23c] surrounded by a ***large*** amount of ***opaque*** material." PO Resp. 22 (citing Ex. 1006, Fig. 1(a)); Ex. 2004 ¶ 63. In support of its view, Patent Owner cites portions of Dr. Kenny's deposition testimony. *See* PO Resp. 22 (citing Ex. 2006, 257:11–18).

Patent Owner further argues that Dr. Kenny, during his deposition, attempted to evade the foregoing problems by "disclaim[ing] Petitioner's reasoning [for obviousness] and assert[ing] new and improper opinions" that undermine the reasoning provided in the Petition. PO Resp. 24. For example, Patent Owner asserts that Dr. Kenny's attempt to distinguish between the '190 patent's Figure 14B as illustrating a lens that condenses *collimated* light toward the center, as compared to Aizawa and Inokawa in which the lens focuses *diffuse* light reflected by the user's body is not

persuasive and is not supported by record evidence. PO Resp. 25–26 (citing Ex. 2006, 170:9–171:5; Ex. 2007, 288:13–289:5, 294:17–298:10, 298:11–299:18, 423:7–424:18); Ex. 2004 ¶¶ 67–68. Patent Owner also objects to Dr. Kenny's testimony that, "while a protruding surface would generally direct more light to the center," it "would also capture some light that otherwise would not be captured" by Aizawa's detectors 22, as lacking evidentiary support and relying on impermissible hindsight. PO Resp. 26–27 (citing Ex. 1001, 7:61–63; Ex. 2004 ¶¶ 69–70; Ex. 2006, 204:21–206:5, 206:22–208:1; Ex. 2007, 294:17–298:10).

Patent Owner moreover asserts that "Dr. Kenny repeatedly distanced himself from his own similar combination" of Aizawa and Inokawa by refusing to talk about the specific shape, size, material, and dimensional tolerances of the combination, so, in Patent Owner's view, his testimony falls short because it demonstrates at most only that the references could have been combined. *Id.* at 2–3, 27–31 (citing, e.g., Ex. 2004 ¶¶ 71–73; Ex. 2006, 51:14–52:16, 75:20–77:2, 91:9–92:13, 96:20–21, 97:11–21, 100:17–101:18, 132:10–18, 154:4–7, 164:8–16, 189:11–190:3; Ex. 2007, 308:12–309:8, 310:18–311:9, 318:3–6, 324:21–325:19, 333:20–335:4).

Indeed, according to Patent Owner, because ordinary skill does not require specific education or experience with optics or optical physiological monitors (*see supra* Section II.C), "[i]t strains credibility that a [person of ordinary skill in the art] . . . could balance all of the factors Dr. Kenny identified" to reach the claimed invention. PO Resp. 32. Patent Owner relies on Dr. Kenny's testimony as establishing the complexity of designing optical physiological sensors. *Id.* at 3–4, 32–33 (citing Ex. 2006, 86:19–87:6; Ex. 2007, 331:19–332:11, 336:11–337:15). Patent Owner concludes

Petitioner has failed to establish a reasonable expectation of success because Dr. Kenny's testimony "focuses almost entirely on manufacturing." *Id.* at 33 (citing Ex. 1003 ¶ 87; Ex. 2004 ¶ 75).

Patent Owner moreover asserts Petitioner errs in relying on Nishikawa as supporting the unpatentability of claim 1, because Nishikawa is "not identified as part of" the ground, which instead "includes only two references," Aizawa and Inokawa. PO Resp. 34 (citing Pet. 1, 13–14; Ex. 1003 ¶¶ 82–87); *id.* at 35–36 (citing 35 U.S.C. § 312(a)(3); *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016)). Patent Owner asserts Dr. Kenny "relies heavily" on Nishikawa, particularly "to inform the specific shape of the cover in his combination, which is found nowhere in Aizawa and Inokawa." *Id.* at 34–35 (citing Pet. 23; Ex. 2004 ¶¶ 76–77; Ex. 2006, 179:21–180:13; Ex. 2007, 364:2–13; Ex. 2008, 73:8–12).

Furthermore, in Patent Owner's view, Dr. Kenny's reliance on Nishikawa "make[s] no sense" because "Nishikawa's device is not a physiological sensor" but rather is "an encapsulated LED" that "directs ***outgoing*** light through the encapsulation material and thus focuses on the emission of light, not the detection of an optical signal." PO Resp. 36 (citing Ex. 1023, code (57), ¶¶ 3, 32, 35; Ex. 2004 ¶ 78). Patent Owner contrasts such disclosure with Aizawa and Inokawa, both of which "detect[] ***incoming*** light that passes through the cover and reaches the detectors," and which have a "drastically" smaller scale than Nishikawa's LEDs. *Id.* (citing Ex. 1008, Fig. 2; Ex. 2004 ¶ 78).

Petitioner's Reply

In reply, Petitioner insists "Inokawa's lens enhances the light-gathering ability of Aizawa," which would have motivated an ordinarily skilled artisan "to incorporate 'an Inokawa-like lens [having a protrusion] into the cover of Aizawa to increase the light collection efficiency.'" Pet. Reply 2–3 (bolding omitted) (citing Pet. 13–15; Ex. 1003 ¶¶ 80–87; Ex. 1008, Fig. 2, ¶¶ 15, 58). Petitioner dismisses Patent Owner's and Dr. Madisetti's opposition as being "misinformed" because a person of ordinary skill in the art "would understand that Inokawa's lens generally improves 'light concentration at pretty much all of the locations under the curvature of the lens,' as opposed to only at a single point at the center." *Id.* at 3–4 (quoting Ex. 2006, 164:8–16); Ex. 1047 ¶¶ 7–9.

For example, Petitioner contends that Patent Owner and Dr. Madisetti "ignore[] the well-known principle of reversibility," by which "a ray going from P to S will trace the same route as one from S to P." Pet. Reply 4 (underlining omitted) (citing, e.g., Ex. 1052,[4] 84, 87–92); Ex. 1047 ¶¶ 10–22. Petitioner contends that Dr. Madisetti was evasive when he was asked to apply the reversibility principle to the combination of Aizawa and Inokawa in this case. Pet. Reply 6 (citing Ex. 1034, 89:12–19, 84:2–85:7). Petitioner further contends that, "based at least on the principle of reversibility," one of ordinary skill in the art "would have understood that both configurations of LEDs and detectors—i.e., with the LED at the center as in Aizawa or with

[4] Eugene Hecht, *Optics* (2nd ed. 1990). In referring to Exhibit 1052, Petitioner refers to the document's native page numbering (top corner of each page) and not the added page numbering of the exhibit (bottom, middle of each page). For consistency, we also refer to the native page numbering of Exhibit 1052.

the detector at the center as in Inokawa—would similarly benefit from the enhanced light-gathering ability of an Inokawa-like lens." *Id.* at 9 (citing Ex. 1047 ¶ 22).

Petitioner also asserts that Patent Owner and Dr. Madisetti overlook the fact that light rays reflected by body tissue in the user's wrist, to be received by detectors in either Aizawa's or Inokawa's pulse sensor, will be "scattered" and "diffuse" and, therefore, will approach the detectors "from various random directions and angles." Pet. Reply 9–10, 13 (annotating Inokawa's Fig. 2 to illustrate the cause and nature of the back-scattering); Ex. 1047 ¶¶ 23–26. This scattered and diffuse light, according to Petitioner, means that Inokawa's "lens cannot focus all light toward the sensor's center," as Patent Owner would have it. Pet. Reply 9 (citing Ex. 1047 ¶ 23; Ex. 2006, 163:12–164:2). Petitioner asserts this is due to Snell's law, and provides several illustrations to illustrate why. *Id.* at 9–15 (citing, e.g., Ex. 1047 ¶¶ 23–34).

Due to the random nature of this scattered light, Petitioner explains that one of ordinary skill in the art would have understood that a convex cover "provides a slight refracting effect, such that light rays that may have missed the detection area are instead directed toward that area." Pet. Reply 10 (citing Ex. 1047 ¶¶ 25–26). Petitioner applies this understanding to Aizawa, and contends that using a lens with a convex protrusion in Aizawa would "enable backscattered light to be detected within a circular active detection area surrounding" a central light source. *Id.*

Moreover, Petitioner dismisses the applicability of Figure 14B of the '190 patent as illustrating the operation of a *transmittance*-type of sensor that measures the attenuation of collimated light transmitted through the

user's body tissue, rather than the *reflectance*-type sensor of Aizawa. *Id*. at 11–13 (citing, e.g., Ex. 1001, 35:65–67; Ex. 1047 ¶¶ 27–31).

Petitioner further maintains that illustrations of the light-focusing properties of a convex lens discussed in the Petition filed in IPR2020-01520 (Ex. 2019, 39) and relied upon by Dr. Kenny (Ex. 2020, 119–120) do not demonstrate "that a convex lens directs all light to the center." Pet. Reply 15 (citing PO Resp. 16–18, 23). Petitioner contends these illustrations, instead, "are merely simplified diagrams included to illustrate . . . one example scenario (based on just one ray and one corpuscle) where a light permeable cover can 'reduce a mean path length of light traveling to the at least four detectors'" as recited in claim 12 of the patent challenged in that proceeding. *Id.* (citing, e.g., Ex. 1047 ¶ 34).

Patent Owner's Sur-reply

Patent Owner asserts that Petitioner's Reply improperly presents several new arguments, relying on new evidence, as compared with the Petition. *See, e.g.*, PO Sur-reply 1 ("new optics theories" and "new arguments"), 2, 6, 7, 9, 10, 12, 13.

Patent Owner also contends that Petitioner mischaracterizes Patent Owner's position, which is not that Inokawa's lens with a convex protrusion "would direct '***all***' light 'only at a ***single point*** at the center'" of the sensor. *Id.* at 2, n.2 (quoting Pet. Reply 3; citing, e.g., Ex. 2027, 63:7–64:6, 94:20–96:1, 96:18–97:7). Patent Owner's position, rather, is that Inokawa's lens condenses more light (not necessarily all light) "***towards the center*** of the sensor" as compared to a flat surface. *Id.* at 2 (quoting PO Resp. 19; citing, e.g., Ex. 2004 ¶¶ 34, 43, 49, 51–52, 54–55, 67).

Patent Owner moreover asserts "[t]here can be no legitimate dispute that a convex surface directs light centrally (and away from the periphery)." PO Sur-reply 3–6 (citing PO Resp. 15–18; Ex. 2006, 164:8–16, 166:10–17, 170:22–171:5; Ex. 2020 ¶¶ 119, 200; Ex. 2027, 181:9–182:5). Patent Owner contends that Petitioner's argument "that Inokawa would improve light-gathering at all locations, ***regardless*** of the location of the LEDs and detectors" is belied by Dr. Kenny's testimony that "Inokawa's benefit would ***not*** be clear if Inokawa's LEDs and detectors were moved" and "confirmed that a convex surface would direct light toward the center of the underlying sensor." *Id.* at 6 (citing Pet. Reply 3–4; Ex. 2006, 86:19–87:6, 202:11–204:20).

Patent Owner argues that Petitioner's discussion of the principle of reversibility is "irrelevant" because it "assumes ideal conditions that are not present when tissue scatters and absorbs light." PO Sur-reply 6–8 (citing Ex. 2027, 17:12–19:2, 29:11–30:7, 31:8–32:3, 38:17–42:6, 207:9–209:21, 210:8–6). The random nature of backscattered light, in Patent Owner's view, "hardly supports Petitioner's argument that light will necessarily travel the same paths regardless of whether the LEDs and detectors are reversed," and is irrelevant to the central issue presented here of "whether a convex surface—***as compared with a flat surface***—would collect and focus additional light on Aizawa's peripherally located detectors." *Id.* at 8–9 (citing Ex. 2027, 212:3–14).

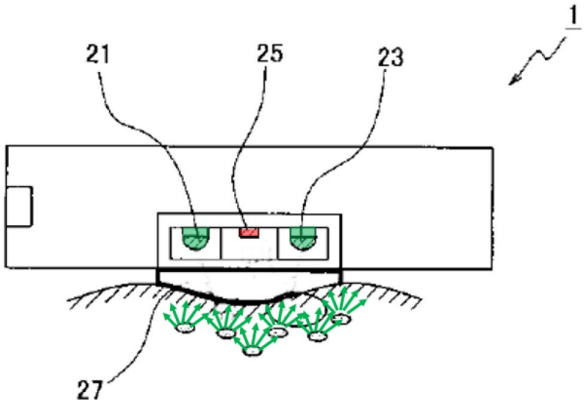
Patent Owner also argues that Petitioner's position that a convex cover will provide a "***slight***" refracting effect, "directly undermines Petitioner's provided ***motivation*** to combine," i.e., to enhance light collection efficiency. *Id.* at 10–11.

Analysis

Upon review of the foregoing, we conclude that a preponderance of the evidence supports Petitioner's view that it would have been obvious to modify Aizawa's cover 6 to include a convex lens or protrusion like that taught in Inokawa, in order to increase the amount of backscattered light that will be received by Aizawa's four peripheral detectors 22, as compared with Aizawa's existing flat cover.

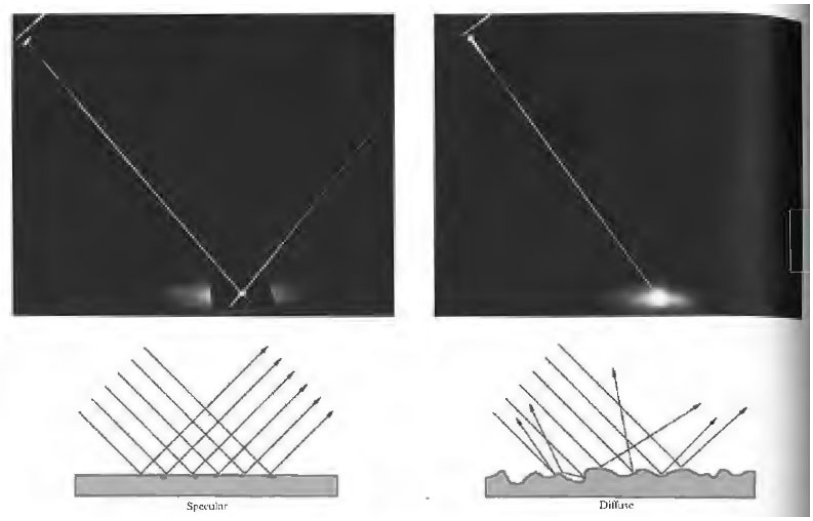
Aizawa's and Inokawa's pulse sensors both gather data by emitting light into the user's wrist tissue and collecting the light that reflects back to the sensor from the user's tissue. *See, e.g.*, Ex. 1006, Figs. 1(b), 2 (sensor 2 has emitter 21 and four detectors 22, all facing a user's wrist 10); Ex. 1008, Figs. 1, 2 (sensor 1 has two emitters 21, 23 and one detector (photodiode 25), all facing the user's wrist when held in place by wristband 5). Dr. Kenny testifies, and Patent Owner agrees, that the reflection of this light by the user's wrist tissue randomizes the propagation direction of the reflected light rays. *See* Ex. 1003 ¶ 117; Ex. 1047 ¶¶ 14–15; Ex. 2020 ¶ 128; PO Sur-reply 7–8 ("Even Petitioner admits that tissue randomly scatters and absorbs light rays.").

This reflection principle is illustrated by Dr. Kenny's annotations to Inokawa's Figure 2 reproduced below:



Here, Dr. Kenny has modified Inokawa's Figure 2 by (1) removing two black arrows, (2) coloring Inokawa's light detector in red and Inokawa's two light emitters in green, and (3) adding several green arrows to illustrate the various directions that light rays may be directed after impinging on and reflecting off different tissues in the user's wrist. Ex. 1047 ¶ 32.

This randomized direction of reflected light rays results in backscattered light that is diffuse, rather than collimated, in nature. Figure 4.12 of Exhibit 1052 illustrates the difference between diffuse and collimated light, and is reproduced below:

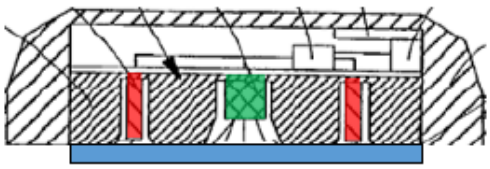


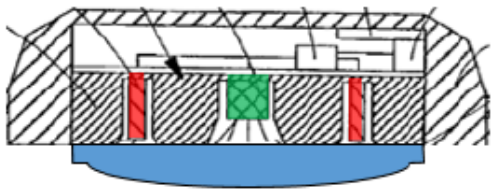
This figure provides at left a photograph and an illustration showing incoming collimated light reflecting from a smooth surface, and at right a photograph and an illustration of incoming collimated light reflecting from a rough surface. *See* Ex. 1052, 87–88. The smooth surface provides specular reflection, in which the reflected light rays are collimated like the incoming light rays. *See id.* By contrast, the rough surface provides diffuse reflection, in which the reflected light rays travel in random directions. *See id.*

This diffuse nature of the light reflected from the user's wrist tissue, which both Aizawa and Inokawa aim to collect to generate pulse data,

suggests that a lens might be useful to increase the amount of collected light and thereby increase the reliability of the pulse data generated using the collected light. Indeed, that is taught by Inokawa. Inokawa describes using its lens 27 to "increase the light-gathering ability" of Inokawa's light photodiode or detector 25.[5] Ex. 1008 ¶¶ 15, 58. Furthermore, there is also no dispute that Inokawa's lens 27 is understood to be shaped as a convex protrusion. *See, e.g.*, Ex. 1003 ¶¶ 83–84 (characterizing Inokawa as teachings a "convex protrusion that acts as a lens"); PO Resp. 1 (describing Inokawa as teaching a "convex lens"). Thus, Inokawa demonstrates that it was known in the art to use a lens comprising a protrusion to focus diffuse light reflected from body tissue on to the light detecting elements of a wrist-worn pulse sensor, and to increase the light gathered by the sensor thereby improving the device's calculation of the user's pulse.

A preponderance of the evidence supports Petitioner's view that it would have been obvious for a person of ordinary skill in the art to apply Inokawa's lens technology to Aizawa's wrist-worn pulse sensor, to similarly improve its light collection as compared to Aizawa's existing flat cover. That is depicted in the following illustrations provided by Dr. Kenny:

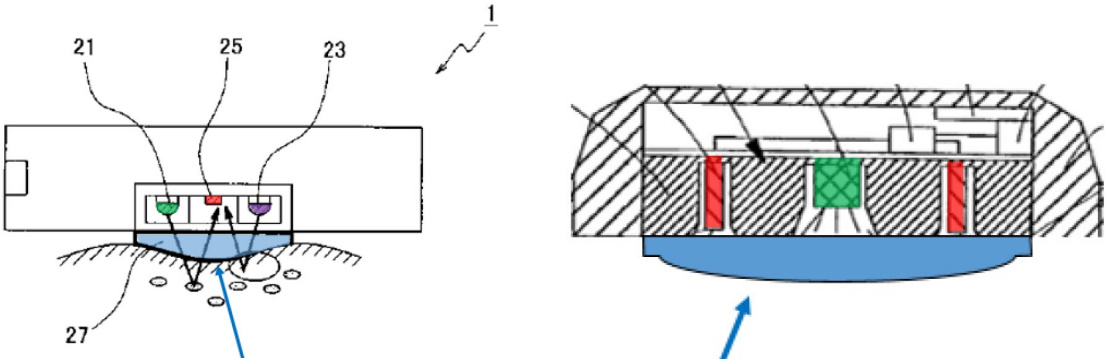




[5] Although Inokawa refers to the "LED" such as emitters 21, 23 in that regard (Ex. 1008 ¶ 15), rather than photodiode 25, it is undisputed that photodiode 25 is the only component of Inokawa's sensor 1 that gathers light.

The illustration at left modifies Aizawa's Figure 1(b) to color Aizawa's emitter in green, its detectors in red, and Aizawa's existing flat cover in blue; the illustration on the right includes Aizawa's Figure 1(b) with the same coloring, but wherein the flat cover is modified to incorporate a convex protrusion that covers Aizawa's peripheral light detectors and central light emitter. *See* Ex. 1003 ¶ 85. We are persuaded by Dr. Kenny's testimony that Snell's law indicates that "light rays that may have otherwise missed the detection area are instead directed toward that area as they pass through the interface provided by the cover," and is especially true "in configurations like Aizawa's in which light detectors are arranged symmetrically about a central light source, so as to enable backscattered light to be detected within a circular active detection area surrounding that source." Ex. 1049 ¶ 26; *see also id.* ¶¶ 23–26.

Patent Owner correctly notes that Inokawa's single detector 25 is located in the central portion of Inokawa's sensor 1, whereas Aizawa's four detectors 22 are located towards the periphery of Aizawa's sensor 2. *Compare* Ex. 1008, Fig. 2, *with* Ex. 1006, Figs. 1(a)–1(b). Nevertheless, Petitioner's proposed modification of Aizawa takes that arrangement into account, as can be seen by the following comparison between Inokawa's sensor and Petitioner's proposed modification of Aizawa's sensor:



The illustration at left annotates Inokawa's Figure 2 to identify the central detector in red and the lens in blue (*see* Ex. 1003 ¶ 83), and the illustration at right annotates Petitioner's proposed modification of Aizawa to illustrate the peripheral detectors in red and the lens in blue (*see id.* ¶ 85). As can be seen, the lenses are not identical. In Inokawa the lens's curvature is most pronounced at the center of the lens near the central detector, and in the proposed modification to Aizawa, the lens's curvature is most pronounced at the edges of the lens near the peripheral detectors. Thus, Dr. Kenny's proposed modification of Aizawa takes Inokawa's general teaching of using a convex protruding lens to increase the amount of incoming light directed to a light detector, and applies it to the four light detectors of Aizawa. *See, e.g.*, Ex. 1003 ¶ 85 ("POSITA would have found it obvious to make the protrusion portion of the LPC [light permeable cover]—namely the lens-shaped light-gathering portion—to ensure that the light-concentration effect achieved by the lens impacts all of the detectors."); *id.* ¶¶ 84–87; Ex. 1047 ¶¶ 7–34.

We are cognizant of Patent Owner's contention that Petitioner's ground "improperly" relies upon a reference, Nishikawa, that was not identified as a part of the ground of unpatentability. PO Resp. 34. As Patent Owner observes, Dr. Kenny characterizes his testimony as being "***inspired*** by" or "motivated" in part based on Nishikawa's disclosure when it comes to the shape of a convex lens. *See, e.g.*, PO Resp. 35–37 (citing, e.g., Ex. 2007, 364:2–13; Ex. 2008, 73:8–12). We, however, disagree with Patent Owner that any impropriety arises from Dr. Kenny's contemplation of the teachings of Nishikawa in connection with the shape of a lens for a physiological sensor. The nature of Petitioner's and Dr. Kenny's

consideration of Nishikawa is explained in cited portions of Dr. Kenny's declaration, even if Nishikawa is not listed as a third reference in the identification of the ground. *See* Ex. 1003 ¶ 87 ("[M]any prior art references of this period, such as Nishikawa (shown below) demonstrate exactly how such a lens shape [as taught by Inokawa] may be incorporated into a molded cover."); Pet. 16. Indeed, it follows readily from the Petition that a skilled artisan would have appreciated that Nishikawa's teachings provide insight as to how "the transparent acrylic material used to make Aizawa's plate can be readily formed into a lens structure as in Inokawa." Pet. 16. Nishikawa describes how its "lens unit 50" can be a transparent resin formed in the shape illustrated in Figure 6 by injection molding. Ex. 1023 ¶¶ 22, 32, 35. Dr. Kenny also explains that Nishikawa's lens shape design "is intended to provide curvature in the lens where it can do the most good and otherwise try to avoid excess use of material in order to create curvature in locations where it wouldn't do any good." Ex. 2006, 179:21–180:13.

Moreover, we observe that a rejection based on obviousness "require[s] an analysis that reads the prior art in context, taking account of 'demands known to the design community,' 'the background knowledge possessed by a person having ordinary skill in the art,' and 'the inferences and creative steps that a person of ordinary skill in the art would employ.'" *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (quoting *KSR*, 550 U.S. at 418). Furthermore, record evidence can be useful to "demonstrate the knowledge and perspective one of ordinary skill in the art." *Id.*; *see also Ariosa Diagnostics v. Verinata Health Inc.*, 805 F.3d 1359, 1365 (Fed. Cir. 2015) ("Art can legitimately serve to document the

knowledge that skill artisan would bring to bear in reading the prior art identified as producing obviousness.").

As noted above, Dr. Kenny makes clear that his view as to obviousness of the claims of the '190 patent was "inspired by" or "motivated" in part by Nishikawa's teachings as to shapes generally known to those in the art of manufacturing a lens. *See, e.g.*, Ex. 2007, 364:2–13; Ex. 2008, 73:12–21. We conclude that the record establishes that Nishikawa's teachings are representative of background knowledge of one of ordinary skill in the art and provide context and perspective of a skilled artisan as to the type of shapes available for a convex protruding surface, such as that disclosed in Inokawa. That Dr. Kenny considered record evidence cited in the Petition as informing his view of what a skilled artisan would understand as to known types of lens shapes does not establish, in our view, any impropriety as part of that ground.

Patent Owner additionally asserts, and Dr. Madisetti testifies, that Petitioner's combination of Aizawa and Inokawa is "problematic" because it overlooks the "small" size of Aizawa's detectors 22 and the openings or cavities 23c in which they are housed. *See* PO Resp. 22 (citing Ex. 1006, Fig. 1(a); Ex. 2004 ¶ 63). Patent Owner, however, does not articulate what significance the size of Aizawa's detector components have in the obviousness evaluation based on the teachings of the prior art.

We additionally do not agree with Patent Owner's argument that Petitioner's Reply presents new arguments and evidence that should have been first presented in the Petition. The Petition proposed a specific modification of Aizawa to include a convex protrusion in the cover, for the purpose of increasing the light gathering ability of Aizawa's device. *See,*

e.g., Pet. 13–16. Patent Owner, in its Response, challenged that contention with several arguments that Petitioner's proposed convex protrusion would not operate in the way the Petition alleged. *See, e.g.*, PO Resp. 16–37. In its Reply, Petitioner provided arguments and evidence attempting to rebut the contentions made in the Patent Owner Response. *See* PTAB Consolidated Trial Practice Guide (Nov. 2019)[6], 73 ("A party also may submit rebuttal evidence in support of its reply."). The Reply does not change Petitioner's theory for obviousness; rather, the Reply presents more argument and evidence in support of the same theory for obviousness presented in the Petition. *Compare* Pet. 13–16, *with* Pet. Reply 2–15.

Patent Owner finally argues that a conclusion of obviousness "strains credibility" because the level of ordinary skill in the art (*see supra* Section II.C) does not require specific education or experience with optics or optical physiological monitors. *See, e.g.*, PO Resp. 32. We disagree. Concerning motivation, the record demonstrates that an ordinarily skilled artisan would have readily appreciated that: (1) Aizawa's detector 1 operates by gathering light with its photodetectors 22; (2) a lens was known to focus light on photodetectors; and (3) optical lenses may be formed by providing a convex protrusion in the lens to focus light. Indeed, Inokawa discloses such utility, function, and structure as a part of its convex lens. *See, e.g.*, Ex. 1008 ¶¶ 15, 58, Fig. 2. We are persuaded that a person of ordinary skill in the art would have understood these general concepts of optics.

Concerning reasonable expectation of success, we credit Dr. Kenny's testimony that a person of ordinary skill in the art would have understood

[6] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

that by "positioning a lens above the optical components of Aizawa . . . the modified cover will allow more light to be gathered and refracted toward the light receiving cavities of Aizawa, thereby further increasing the light-gathering ability of Aizawa beyond what is achieved through the tapered cavities," and "would have found it obvious to make the protrusion portion of the LPC—namely the lens-shaped light-gathering portion—to ensure that the light-concentration effect achieved by the lens impacts all of the detectors." *See, e.g.*, Ex. 1003 ¶ 85; Ex. 2006, 179:21–180:13, 202:11–20.

Thus, we conclude that one of ordinary skill in the art would have had adequate reason to replace Aizawa's flat cover 6 with a cover comprising a convex protrusion, to improve light detection efficiency, and would have had a reasonable expectation of success in doing so.

vi. Summary

For the foregoing reasons, we determine that Petitioner has met its burden of demonstrating by a preponderance of the evidence that claim 1 would have been obvious over the cited combination of references.

4. Independent Claim 26

Independent claim 26 consists of limitations that are substantially similar to elements [a]–[d] of claim 1. *Compare* Ex. 1001, 44:37–53, *with id.* at 46:22–40 (reciting a "circular housing" with a "wall"; reciting a "lens portion"). In asserting that claim 26 would have been obvious over the combined teachings of Aizawa and Inokawa, Petitioner refers to substantially the same contentions presented as to claim 1. *See* Pet. 39–41; Ex. 1003 ¶¶ 119–124.

Patent Owner does not present any argument for this claim other than those we have already considered with respect to independent claim 1. PO Resp. 12–41.

For the same reasons discussed above, we determine that Petitioner has met its burden of demonstrating by a preponderance of the evidence that claim 26 would have been obvious over the cited combination of references. *See supra* II.D.3.i–v; Ex. 1003 ¶¶ 119–124.

5. Dependent Claims 2–14, 16, 17, 19–23, and 27–29

i. Dependent Claim 5

Petitioner identifies dependent claim 5 as being challenged in its proposed ground of unpatentability based on Aizawa and Inokawa. *See* Pet. 1 (listing claims 1–14, 16, 17, 19–23, 26–29 as part of this ground), 8 (heading identifying the same challenged claims). But, Petitioner does not present any contentions addressing the specific limitations of claim 5. *See id.* at 23–42 (purportedly addressing all challenged claims beyond claim 1, but failing to discuss claim 5). As such, Petitioner has not met its burden.

ii. Dependent Claims 2–4, 6–14, 16, 17, 19–23, and 27–29

Petitioner presents undisputed contentions that claims 2–4, 6–14, 16, 17, 19–23, and 27–29, which depend directly or indirectly from independent claim 1 or 26, are unpatentable over the combined teachings of Aizawa and Inokawa, and provides arguments explaining how the references teach the limitations of these claims. Pet. 23–39, 41–42; Ex. 1003 ¶¶ 88–118, 125–127.

Patent Owner does not present any arguments for these claims other than those we have already considered with respect to independent claim 1. PO Resp. 41 ("The Petition fails to establish that independent claims 1 and 26 are obvious and thus fails to establish any of the challenged dependent claims are obvious.").

We have considered the evidence and arguments of record and determine that Petitioner has demonstrated by a preponderance of the evidence that claims 2–4, 6–14, 16, 17, 19–23, and 27–29 would have been obvious over the combined teachings of the cited references and as supported by the testimony of Dr. Kenny.

E. Obviousness over the Combined Teachings of Aizawa, Inokawa, and Mendelson-2006

Petitioner contends that claims 23 and 24 are unpatentable based on Aizawa, Inokawa, and Mendelson-2006. Pet. 45–50. Claim 23 depends from claim 1 and recites, "[t]he noninvasive optical physiological measurement device is comprised as part of a mobile monitoring device." Ex. 1001, 46:8–11. Claim 24 depends from claim 23 and further recites, "the mobile monitoring device includes a touch-screen display." *Id.* at 46:12–14.

1. Mendelson-2006 (Ex. 1016)

Mendelson-2006 is a journal article titled "A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring," and discloses a

wireless wearable pulse oximeter connected to a personal digital assistant ("PDA"). Ex. 1016, 912.[7]

Figure 1 of Mendelson-2006 is reproduced below.

Figure 1, at top, illustrates a sensor module attached to the skin and, at bottom, presents a photograph of a disassembled sensor module and receiver module. The sensor module includes an optical transducer, a stack of round printed circuit boards, and a coin cell battery. *Id.* at 2.

[7] Petitioner cites to the native page numbering within Exhibit 1016. *See, e.g.*, Pet. 45–50. We follow Petitioner's numbering scheme.

Figure 2 of Mendelson-2006 is reproduced below.

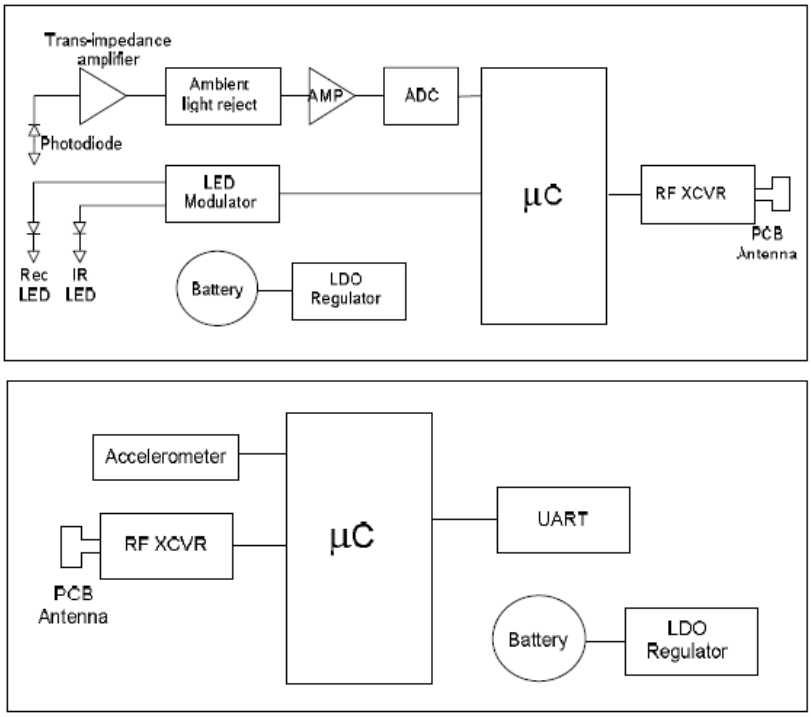


Figure 2 depicts a system block diagram of the wearable, wireless, pulse oximeter including the sensor module, at top, and the receiver module, at bottom. *Id.* The sensor module includes at least one LED, a photodetector, signal processing circuitry, an embedded microcontroller, and an RF transceiver. *Id.* at 1–2. Mendelson-2006 discloses that a concentric array of discrete photodetectors could be used to increase the amount of backscattered light detected by a reflectance type pulse oximeter sensor. *Id.* at 4. The receiver module includes an embedded microcontroller, an RF transceiver for communicating with the sensor module, and a wireless module for communicating with the PDA. *Id.* at 2.

As a PDA for use with the system, Mendelson-2006 discloses "the HP iPAQ h4150 PDA because it can support both 802.11b and Bluetooth™ wireless communication" and "has sufficient computational resources." *Id.* at 3. Mendelson-2006 further discloses that

> [t]he use of a PDA as a local terminal also provides a low-cost touch screen interface. The user-friendly touch screen of the PDA offers additional flexibility. It enables multiple controls to occupy the same physical space and the controls appear only when needed. Additionally, a touch screen reduces development cost and time, because no external hardware is required. . . . The PDA can also serve to temporarily store vital medical information received from the wearable unit.

Id.

The PDA is shown in Figure 3 of Mendelson-2006, reproduced below.

Figure 3 illustrates a sample PDA and its graphical user interface ("GUI"). *Id.* Mendelson-2006 explains that the GUI allows the user to interact with the wearable system. *Id.* "The GUI was configured to present the input and output information to the user and allows easy activation of various functions." *Id.* "The GUI also displays the subject's vital signs, activity level, body orientation, and a scrollable PPG waveform that is transmitted by the wearable device." *Id.* For example, the GUI displays numerical oxygen saturation ("SpO_2") and heart rate ("HR") values. *Id.*

2. Analysis

With support from the testimony of Dr. Kenny, Petitioner contends that claims 23 and 24 are unpatentable based on Aizawa, Inokawa, and Mendelson-2006. Pet. 45–50 (citing Ex. 1003 ¶¶ 69–71, 133–136; Ex. 1006 ¶¶ 2, 15, 23, 35; Ex. 1008 ¶ 56; Ex. 1016, 912–914, Figs. 1, 3; Ex. 1022). For instance, Petitioner applies the teachings of Mendelson-2006 to account for the mobile monitoring device features required by claim 23 and the touch-screen display recited in claim 24. *Id.*

Patent Owner does not separately address this ground, urging only that the ground "do[es] not fix the deficiencies" alleged in connection with the ground based on Aizawa and Inokawa. PO Resp. 41. As discussed above, we do not agree with Patent Owner as to any such deficiencies. *See supra* § II.D.

We have reviewed the Petition and its supporting evidence and conclude that Petitioner has shown by a preponderance of the evidence that claims 23 and 24 are unpatentable based on Aizawa, Inokawa, and Mendelson-2006.

F. Obviousness over the Combined Teachings of Aizawa, Inokawa, Mendelson-2006, and Beyer

Petitioner contends that claim 25 is unpatentable based on Aizawa, Inokawa, Mendelson-2006, and Beyer. Pet. 56–60. Claim 25 depends from claim 1 and recites, "a processor configured to receive the one or more signals and communicate physiological measurement information to a mobile phone." Ex. 1001, 46:15–21.

1. Overview of Beyer (Ex. 1019)

Beyer is a U.S. patent titled "Cellular Phone/PDA Communication System," and discloses a "cellular PDA communication system for allowing a plurality of cellular phone users to monitor each others' location and status[and] to initiate cellular phone calls." Ex. 1019, code (57). Beyer's Figure 1 is reproduced below.

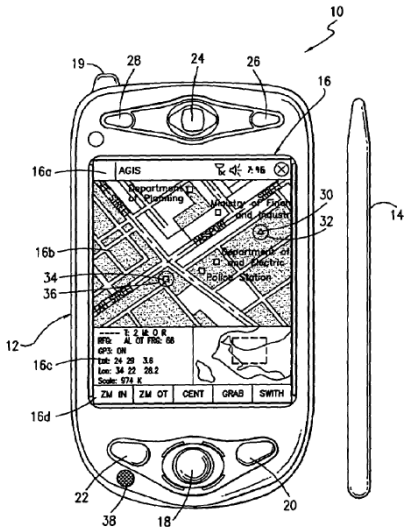


FIG. 1

Figure 1 depicts a "cellular phone/PDA and display." *Id.* at 7:8–9.

2. Analysis

With support from the testimony of Dr. Kenny, Petitioner contends that claim 25 is unpatentable based on Aizawa, Inokawa, Mendelson-2006, and Beyer. Pet. 56–60 (citing, e.g., Ex. 1003 ¶¶ 150–156; Ex. 1016, 913–914; Ex. 1019, 1:6–15, Fig. 1). For instance, Petitioner applies the teachings of Beyer to account for the processor features required by claim 25. *Id.*

Patent Owner does not separately address this ground, urging only that the ground "do[es] not fix the deficiencies" alleged in connection with the ground based on Aizawa and Inokawa. PO Resp. 41. As discussed

above, we do not agree with Patent Owner as to any such deficiencies. *See supra* § II.D.

We have reviewed the Petition and its supporting evidence and conclude that Petitioner has shown by a preponderance of the evidence that claim 25 is unpatentable based on Aizawa, Inokawa, Mendelson-2006, and Beyer.

G. Obviousness over the Combined Teachings of Aizawa, Inokawa, and Al-Ali

Petitioner contends that claim 5 is unpatentable over Aizawa, Inokawa, and Al-Ali. Pet. 60–62. Dependent claim 5 ultimately depends from independent claim 1 and recites that "the light permeable cover comprises a conductive layer configured to shield the at least four detectors from noise." Ex. 1001, 44:64–67.

1. Overview of Al-Ali (Ex. 1030)

Al-Ali is a U.S. patent application publication titled "Multiple Wavelength Optical Sensor." Ex. 1030, code (54). Al-Ali discloses an optical sensor with an emitter that radiates light into a tissue site to be received by a detector such that, e.g., oxygen saturation may be derived. *Id.* at code (57). Al-Ali describes detector 1900 having shield 1910 with conductive surface 1920 defining windows, shown below in Figure 19A-B. *Id.* ¶ 71.

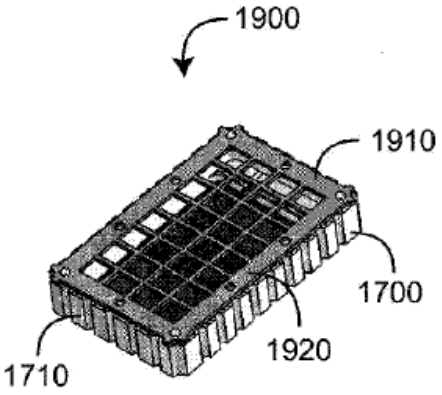


FIG. 19A

Figure 19A depicts a top view of a detector. Al-Ali explains that light is permitted to pass through the windows, while other electromagnetic noise is blocked. *Id*. Al-Ali explains that additional shielding material also can be applied to the ceramic substrate 1710. *Id.*

2. Analysis

Petitioner contends that "Al-Ali teaches shielding the detectors of a pulse oximeter/optical sensor by placing a conductive shield 1920 above the housing, thereby providing a Faraday cage that can allow 'passage of light' to the detectors while 'blocking . . . electromagnetic noise.'" *Id.* at 60 (citing Ex. 1030 ¶ 71, Fig. 19A; Ex. 1003 ¶ 156-A). Petitioner asserts this "improve[s] the sensitivity of the detectors, thereby leading to more reliable pulse/signal detection." *Id.* at 61.

According to Petitioner, a person of ordinary skill in the art "would have found it obvious to add a similar conductive shield/layer between the detectors and the LPC to prevent electromagnetic noise from reaching the detectors while still allowing desired signals/wavelengths to pass through, thereby reducing the effects of noise and resulting in improved light

collection efficiency." *Id.* (citing Ex. 1003 ¶ 156-B). Petitioner contends that this "entails the use of known solutions to improve similar systems and methods in the same way," and "would have led to [the] predictable result of reducing noise and improving signal collection without significantly altering or hindering the functions performed by Aizawa." *Id.* at 62 (citing Ex. 1003 ¶ 156-C).

Patent Owner does not separately address this ground, urging only that the ground "do[es] not fix the deficiencies" alleged in connection with the ground based on Aizawa and Inokawa. PO Resp. 41. As discussed above, we do not agree with Patent Owner as to any such deficiencies. *See supra* § II.D.

We have reviewed the Petition and its supporting evidence and conclude that Petitioner has shown by a preponderance of the evidence that claim 5 is unpatentable based on Aizawa, Inokawa, and Al-Ali. Specifically, Al-Ali teaches the use of a conductive material to eliminate noise. Ex. 1030 ¶ 71. In light of this teaching, we credit Dr. Kenny's unrebutted testimony that a person of ordinary skill in the art would have found it obvious to implement such a conductive material in the sensor of Aizawa and Inokawa to reduce noise, as was well-known in the art. Ex. 1003 ¶¶ 156-A, 156-B.

H. Obviousness over the Combined Teachings of Aizawa, Inokawa, and Ohsaki

Petitioner contends that claims 1–14, 16, 17, 19–23, and 26–29 are unpatentable over Aizawa, Inokawa, and Ohsaki. Pet. 42–45.

Because we have already determined that these claims are unpatentable based on Aizawa and Inokawa, which is dispositive as to these challenged claims, we need not reach this additional ground applied to these

claims. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner "is entitled to a final written decision addressing all of the claims it has challenged"); *Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App'x 984, 990 (Fed. Cir. 2020) ("[T]he Board need not address issues that are not necessary to the resolution of the proceeding.").

I. Obviousness over the Combined Teachings of Aizawa, Inokawa, Goldsmith, and Lo

Petitioner contends that claims 23–25 are unpatentable over Aizawa, Inokawa, Goldsmith, and Lo. Pet. 51–56.

Because we have already determined that these claims are unpatentable based on Aizawa, Inokawa, and Mendelson-2006 (claims 23–24) or Mendelson-2006 and Beyer (claim 25), we need not reach this additional ground applied to these claims. *See SAS Inst.*, 138 S. Ct. at 1359; *Boston Sci.*, 809 F. App'x at 990.

J. Obviousness over the Combined Teachings of Mendelson-1988 and Inokawa

Petitioner contends that claims 1–14, 16–22, and 26–30 of the '190 patent would have been obvious over the combined teachings of Mendelson-1988 and Inokawa. Pet. 62–94.

1. Overview of Mendelson-1988 (Ex. 1015)

Mendelson-1988 discloses a pulse oximeter, with an optical reflectance sensor suitable for noninvasive monitoring of a user's arterial hemoglobin oxygen saturation (SpO_2), via the user's forehead. *See* Ex. 1015, 167 (title & abstract).

Figure 2 is reproduced below:

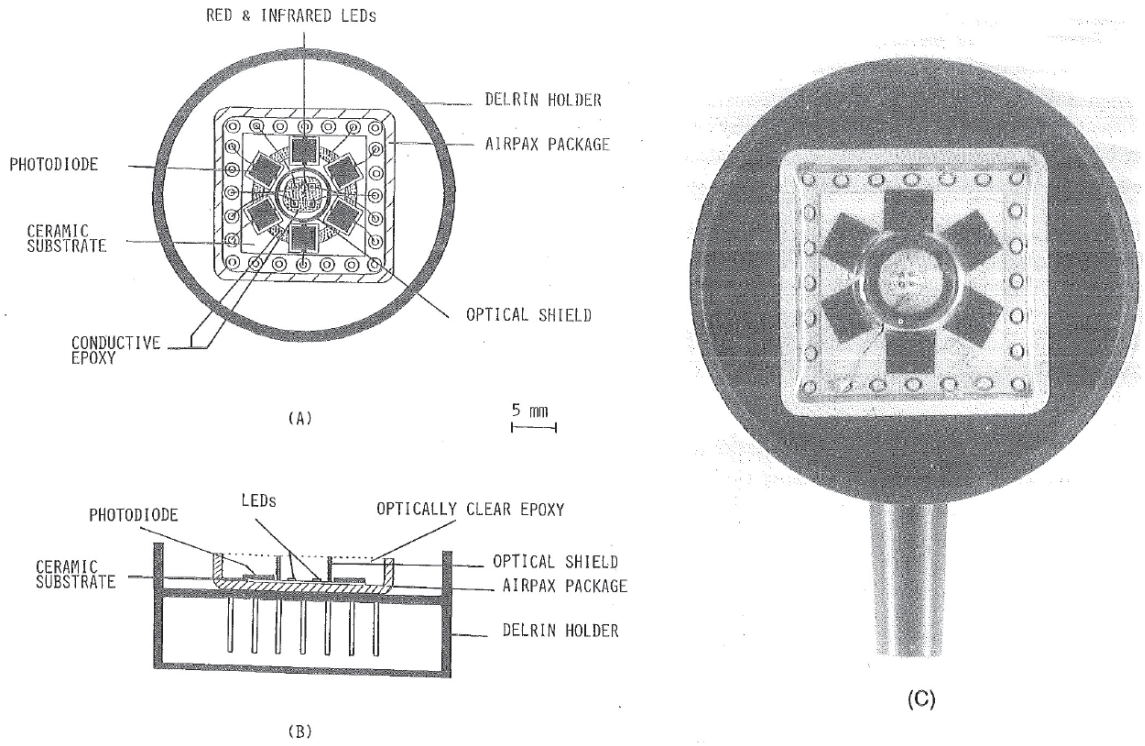


Figure 2 illustrates the sensor of Mendelson-1988, including: (A) a top view diagram; (B) a side view diagram; and (C) a photograph. *Id.* at 169.

The sensor includes two red LEDs and two infrared LEDs for emitting light into the user's tissue, and six photodiodes "arranged symmetrically in a hexagonal configuration" surrounding the four emitters, to detect light reflected back to the sensor from the user's tissue. *Id.* at 168 ("SENSOR DESIGN"). The user's "SpO_2 can be calculated from the ratio of the reflected red and infrared photoplethysmograms." *Id.* at 167. "To minimize the amount of light transmission and reflection between the LEDs and the photodiodes within the sensor, a ring-shaped, optically opaque shield of black Delrin . . . was placed between the LEDs and the photodiode chips." *Id.* at 168 (col. 2). "The optical components were encapsulated inside the

package using optically clear adhesive." *Id.* "The microelectronic package was mounted inside a black Delrin housing." *Id.*

2. Independent Claim 1

Petitioner contends that claim 1 would have been obvious over the combined teachings of Mendelson-1988 and Inokawa. Pet. 63–67 (combination), 68–75 (claim 1).

i. "A noninvasive optical physiological measurement device adapted to be worn by a wearer, the noninvasive optical physiological measurement device providing an indication of a physiological parameter of the wearer comprising"

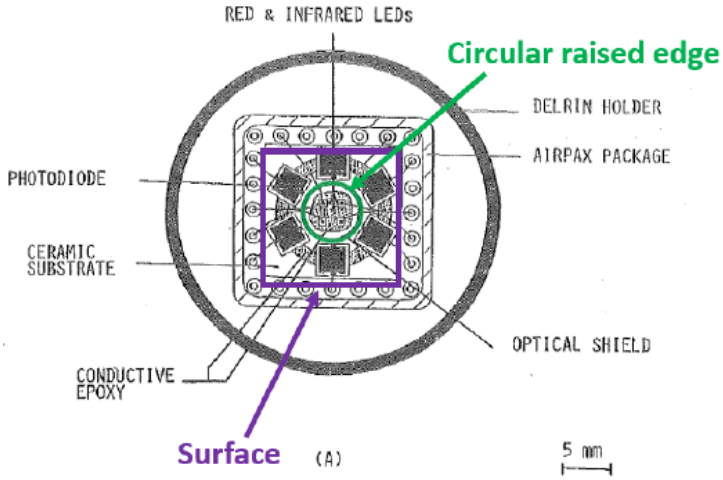
The cited evidence supports Petitioner's undisputed contention that Mendelson-1988 discloses a noninvasive optical physiological measurement device, i.e., an "optical reflectance sensor" that monitors "arterial hemoglobin oxygen saturation," a physiological parameter of the wearer. Pet. 68; *see, e.g.*, Ex. 1015, code (57), 167, 172; Ex. 1003 ¶ 157.

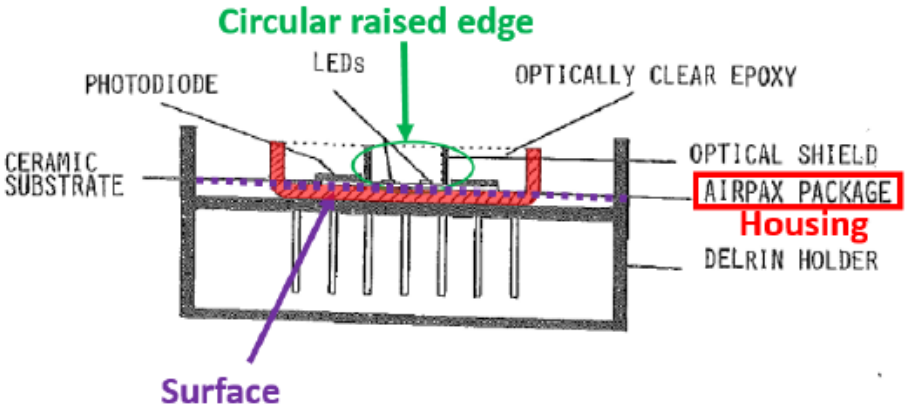
ii. "[a] one or more light emitters"

The cited evidence supports Petitioner's undisputed contention that Mendelson-1988 discloses two red LEDs and two infrared LEDs. Pet. 68; *see, e.g.*, Ex. 1015, 168 ("The optical reflectance sensor used in this study consists of two red (peak emission wavelength: 660 nm) and two infrared (peak emission wavelength: 930 nm) LED chips.")), Fig. 2(a); Ex. 1003 ¶ 158.

iii. "[b] a housing having a surface and a circular raised edge extending from the surface"

The cited evidence supports Petitioner's undisputed contention that Mendelson-1988 discloses an AIRPAX package, i.e., a housing with a ceramic substrate, i.e., a surface, and a circular raised edge extending from the surface. Pet. 69. Petitioner's annotated versions of Mendelson-1988's Figures 2A and 2B are reproduced below.





Pet. 69–70. The modified figures depict top and side views of Mendelson-1988's sensor with a housing (depicted in red) having a surface (depicted in

purple) with a circular raised edge (depicted in green) extending from the surface. *Id.*; Ex. 1003 ¶ 159.[8]

iv. "[c] at least four detectors arranged on the surface and spaced apart from each other, the at least four detectors configured to output one or more signals responsive to light from the one or more light emitters attenuated by body tissue, the one or more signals indicative of a physiological parameter of the wearer"

The cited evidence supports Petitioner's undisputed contention that Mendelson-1998 discloses "six silicon photodiodes . . . arranged symmetrically in a hexagonal configuration" on the surface. Pet. 69, 72; *see, e.g.*, Ex. 1015, 168, Figs. 2(A)–(B). Mendelson-1998 discloses that the photodiodes output "current pulses" indicative of a physiological parameter of the wearer in response to light emitted by the emitters and reflected from the skin. Pet. 72–73; *see, e.g.*, Ex. 1015, 167 ("SpO_2 can be calculated from the ratio of the reflected red and infrared photoplethysmograms."); Ex. 1003 ¶ 163.

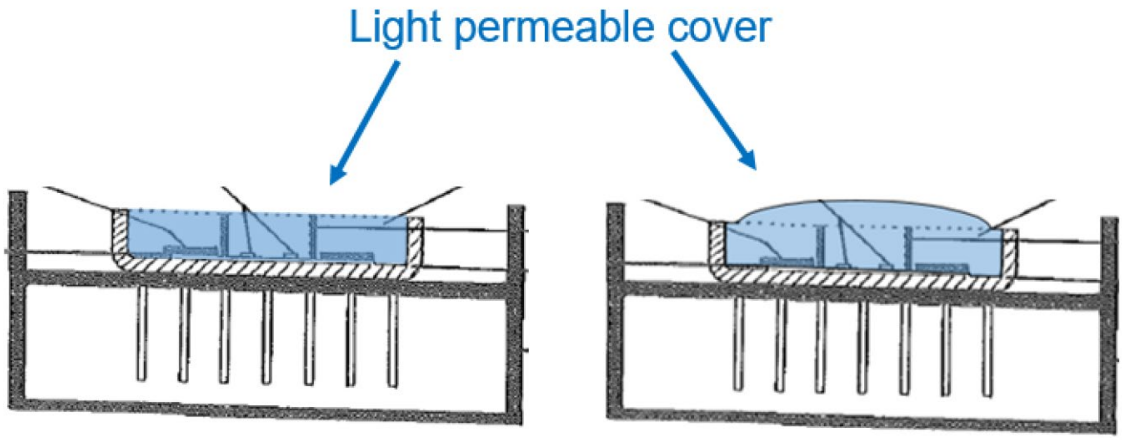
[8] Petitioner also alleges that, "[a]lternatively, the outer wall of the AIRPAX microelectronic package (housing), as indicated below, can be modified to be a circular raised edge extending from the surface." Pet. 70–72 (emphasis omitted). We do not rely on this alternative contention regarding claim 1.

v. *"[d] a light permeable cover arranged above at least a portion of the housing, the light permeable cover comprising a protrusion arranged to cover the at least four detectors."*

Petitioner's Contentions

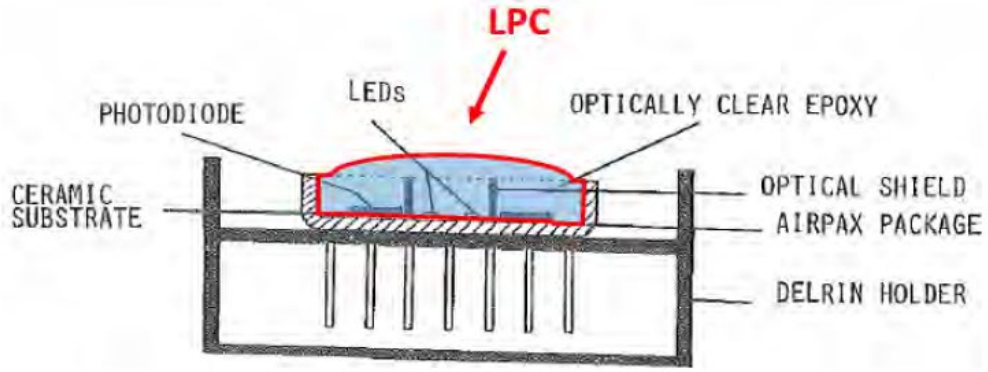
Petitioner contends that Mendelson-1988's sensor discloses all limitations of claim 1, except that its light permeable cover, i.e., the "OPTICALLY CLEAR EPOXY" in Figure 2B, which is arranged above a portion of the housing and covers the detectors, lacks the claimed "protrusion." *See* Pet. 73–75; Ex. 1003 ¶¶ 165–171. As discussed above in Section II.D.3, Petitioner contends that Inokawa's sensor includes lens 27, comprising a convex protrusion arranged to cover its light detector 25. Pet. 65. Petitioner reasons that an ordinarily skilled artisan would have been motivated, with a reasonable expectation of success, to modify Mendelson-1988's optical SpO_2 sensor, in light of Inokawa's optical pulse sensor, by adding a lens with a protrusion to Mendelson-1988's cover to improve the sensor's light detection efficiency. *Id.* at 66.

Dr. Kenny provides the following illustrations to portray the proposed modification of Mendelson-1988's sensor (Ex. 1003 ¶ 168):

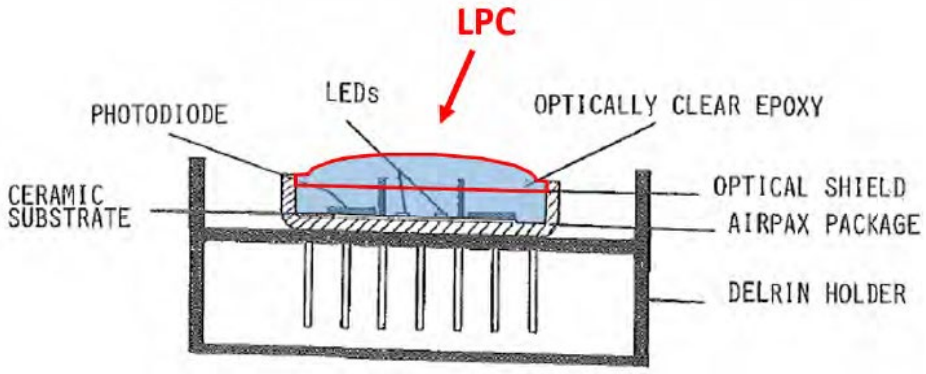


At the left, Dr. Kenny has excerpted and annotated Mendelson-1988's Figure 2B, to identify the pre-existing cover (colored blue) which covers the light emitters and detectors. *See id.* At the right, Dr. Kenny has illustrated the device resulting from the proposed modification of the cover to have a protrusion (also colored blue). *See id.*

Petitioner further asserts "there are two alternative ways of mapping the claimed 'light permeable cover,' or LPC, to the modified cover above." Pet. 74; Ex. 1003 ¶¶ 172–173. Dr. Kenny provides the following two annotations of Mendelson-1988's Figure 2B to identify these alternative mappings:



APPLE-1015, FIG. 2(B)



APPLE-1015, FIG. 2(B).

Dr. Kenny's first mapping (top figure) equates the cover to the entire depth of the epoxy contained within the AIRPAX package as shown in red outline. Ex. 1003 ¶ 172. Dr. Kenny's second mapping (bottom figure) equates the cover to a partial depth of the epoxy within the package as shown in red outline. *Id.* ¶ 173 ("[A person of ordinary skill in the art] would have been able to use the top portion of the housing . . ., as in Nishikawa, to help form the LPC portion on top of the sealing portion.").

Petitioner adds that a person of ordinary skill in the art "would have realized that the epoxy layer [of Mendelson-1998] could have been given a shape that would help further advance Mendelson-1988's objective of improving detection efficiency," "requir[ing] only routine knowledge of sensor design and assembly." Pet. 64, 66 (citing Ex. 1015, 168, 173); Ex. 1003 ¶¶ 165, 169. For example, "as demonstrated by Nishikawa, molding clear epoxy, as in Mendelson-1988, into a lens was well understood." Pet. 66–67 (citing Ex. 1023, Fig. 6, ¶¶ 22, 32, 35, 37; Ex. 1003 ¶ 170).

Patent Owner's Arguments

Patent Owner is of the view that Petitioner has not met its burden to demonstrate the obviousness of modifying Mendelson-1988's sensor to have a protrusion, based on substantially the same analysis and testimony discussed above in the context of combining Aizawa and Inokawa. *See* PO Resp. 43–46; Ex. 2004 ¶¶ 94–100; *supra* Section II.D.3. For example, Mendelson-1988, like Aizawa, provides a central emitter or emitters surrounded by several detectors. *Compare* Ex. 1015, 169 (Fig. 2) (showing four central LEDs surrounded by six photodiodes), *with* Ex. 1006,

Figs. 1(a)–1(b) (showing one central LED 21 surrounded by four photodetectors 22).

Patent Owner argues that Mendelson-1988 discloses only that it encapsulates its electronic components with a flat optically clear adhesive/epoxy, which is not a "cover." PO Resp. 46 (citing Ex. 1004 ¶¶ 102–103). Patent Owner contends that the '190 patent distinguishes between resin and covers. PO Resp. 47 (citing Ex. 1001, 36:37–46). Patent Owner also argues that Nishikawa, on which Petitioner relies, "never mentions a cover, and instead discusses encapsulation of components using an integrally molded resin." *Id.* (citing Ex. 1023 ¶ 35). Likewise, Patent Owner characterizes Inokawa's cover as a "***distinct structure***, not an undifferentiated mass of resin on a surface." *Id.* (citing Ex. 1008 ¶ 103).

Patent Owner also objects to Petitioner's alternative mapping, providing for a cover with a protrusion to be found in two different ways. *See* PO Resp. 46–49; Ex. 2004 ¶¶ 102–107. This alternative mapping, in according to Patent Owner, is "ambiguous[]," and the second mapping incorporates an "arbitrary" line drawn to define the bottom of the cover in "an ***undifferentiated*** mass of material." PO Resp. 48–49. Patent Owner also argues that "Petitioner's inability to consistently identify a 'cover' reveals the hindsight-driven nature of its arguments." *Id.* at 49.

Petitioner's Reply

Petitioner maintains that the Petition and supporting testimony adequately account for the "cover" required by the claims of the '190 patent, including the "alternative mapping" configuration. Pet. Reply 22.

Patent Owner's Sur-reply

Patent Owner's Sur-reply generally reiterates its arguments challenging Petitioner's contentions. PO Sur-reply 18–20.

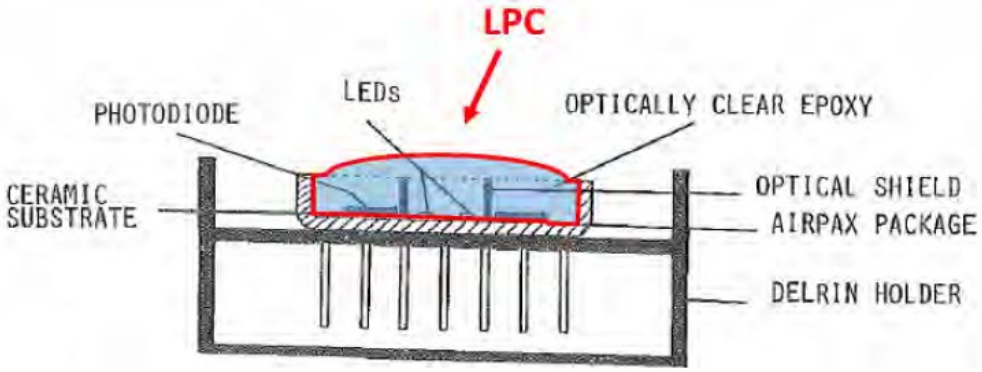
Analysis

As an initial matter, we find that a preponderance of the evidence establishes that the Mendelson-1988 sensor's optically clear epoxy is a light permeable cover that is arranged above a portion of the housing and covers the sensor's detectors. In particular, it is clear from Figures 2A and 2B that the epoxy extends from the top of the sensor at the dotted line in the figure, down into the well of the AIRPAX package, to cover all four LEDs and all six photodiodes disposed at the bottom of the well. *See also* Ex. 1015, 168 ("The optical components were encapsulated inside the package using optically clear adhesive."). Although Patent Owner disagrees, its position is premised on its proposed claim construction of the term "cover" as excluding resins and epoxies. *See* PO Resp. 46–48. For reasons provided in Section II.A.1 above, we do not find that claim construction persuasive, and Patent Owner does not distinguish Mendelson-1988 from claim 1 on this basis.

Thus, we determine that Petitioner has established persuasively that Mendelson-1988's sensor teaches every limitation of claim 1, except that its light permeable cover has a flat surface and, thus, does not include a "protrusion." We, however, conclude that a preponderance of the evidence supports Petitioner's contention that it would have been obvious to modify the top surface of Mendelson-1988's cover to include a protrusion, in order to increase the amount of backscattered light received by Mendelson-1988's peripheral detectors. Our reasoning is substantially identical to the analysis

provided above in connection with the ground based on Aizawa and Inokawa, with Mendelson-1988 replacing Aizawa in the combination. *See supra* Section II.D.3. Patent Owner does not cite, and we do not discern, any material difference between Mendelson-1988 and Aizawa that might lead to a different result here, with one possible exception.

That difference is Petitioner's alternative mapping of the claimed "cover" in the proposed modification of Mendelson-1988. We rely on the first mapping, but not the second, to decide in Petitioner's favor. Petitioner's first mapping is again reproduced here (Ex. 1003 ¶ 172):



APPLE-1015, FIG. 2(B)

In this modified and annotated version of Figure 2B of Mendelson-1988, Dr. Kenny identifies how Mendelson-1988's light permeable cover may be modified to have a protrusion, wherein the modified cover (colored blue) includes the entire depth of the optically clear epoxy contained within the AIRPAX package (outlined red). *Id.*; Pet. 74. Patent Owner objects to this mapping as ambiguous, but we determine Dr. Kenny's annotations reproduced above are sufficiently clear to establish obviousness by a preponderance of the evidence.

vi. Summary

For the foregoing reasons, we determine that Petitioner has met its burden of demonstrating by a preponderance of the evidence that claim 1 would have been obvious over the cited combination of references.

3. Independent Claim 26

Independent claim 26 consists of limitations that are substantially similar to elements [a]–[d] of claim 1. *Compare* Ex. 1001, 44:37–53, *with id.* at 46:22–40 (reciting a "circular housing" with a "wall"; reciting a "lens portion . . . in optical communication with the . . . detectors"). In asserting that claim 26 would have been obvious over the combined teachings of Mendelson-1988 and Inokawa, Petitioner refers to many of the same contentions presented as to claim 1. *See* Pet. 88–91; Ex. 1003 ¶¶ 206–212.

We address the parties' contentions to the extent they vary or expand upon those discussed above. We do not address contentions that we have already considered with respect to independent claim 1.

With respect to the limitation reciting "a lens portion . . . comprising a protrusion in optical communication with the at least four detectors," Petitioner additionally contends that "because reflected light received by Mendelson-1988's six detectors passes through the protruded lens portion as provided by Inokawa, the lens/protrusion is in optical communication with the detectors." Pet. 91. We agree. As discussed in Section II.J.2.v, we are persuaded that an ordinarily skilled artisan would have been motivated, with a reasonable expectation of success, to modify Mendelson-1988's sensor, in light of Inokawa's sensor, by adding a protruding lens to Mendelson-1988's cover to improve the sensor's light detection efficiency. *See, e.g.*, Pet. 66. In the proposed modification, emitted and reflected light passes through the

added lens/protrusion, taught by Inokawa, before reaching the detectors. Ex. 1003 ¶ 211. As such, we agree that it is "in optical communication," as claimed.

With respect to the limitation reciting "a circular housing comprising a surface and a wall protruding from the surface," Petitioner contends that "[a]lthough the housing [of Mendelson-1998] appears to have a square shape, not a circular one, a [person of ordinary skill in the art] would have recognized that microelectronic packaging as used in Mendelson-1988 comes in various shapes and sizes," and that such an artisan "would have considered using a differently shaped housing, namely a circular one, to be obvious" because a circular housing with a circular wall was well known and the shape would have imparted nothing new or inventive. Pet. 89–90 (citing, e.g., Ex. 1003 ¶¶ 206–209). For example, Petitioner relies on Mendelson-799,[9] which discloses a sensor for an optical measurement device having a circular shape. *Id.* (citing Ex. 1025, Fig. 7, 9:34–36).

Patent Owner argues that Mendelson-1988 and Inokawa provide square housings for their components. PO Resp. 52. According to Patent Owner, "Petition never identifies a motivation to pick a circular-shaped housing instead of the existing square shape" and that a skilled artisan would not have made such a modification without some perceived benefit for doing so. *Id.* at 53 (citing, e.g., Ex. 2004 ¶ 114). Patent Owner objects to Petitioner's reliance on the sensor shape taught by Mendelson-799 because (1) Mendelson-799 is not included in any ground, and (2) Mendelson-799

[9] U.S. Patent No. 6,801,799 B2, filed Feb. 6, 2003, issued Oct. 5, 2004 ("Mendelson-799," Ex. 1025).

does not disclose a cover and, as such, "cannot disclose a circular housing and a cover of the circular housing, as claim 26 requires." *Id.*

In its Reply, Petitioner contends that "neither the '190 patent nor [Patent Owner] provides any explanation of how the particular housing shape solves some problem or presents some unexpected result." Pet. Reply 24.

In its Sur-reply, Patent Owner reiterates its positions from its Response. PO Sur-reply 21.

We are persuaded by Petitioner's contentions. As discussed in Section II.J.2.iii, Mendelson-1988 discloses a housing in the form of an AIRPAX package that has a square shape when viewed from above. *See* Ex. 1015, Fig. 2(A). Petitioner's and Dr. Kenny's general assessment that a person of ordinary skill in the art would have understood that a circular housing shape was a known option for housing components of a physiological sensor finds support in the record. Pet. 88–90; Ex. 1003 ¶¶ 208–209. In that respect, although Mendelson-799 was not listed in the styling of the proposed grounds of unpatentability, its teachings plainly were offered in the Petition as evidence of the background knowledge that an ordinarily skilled artisan would have brought to bear in an evaluation of the teachings of Mendelson-1988 and Inokawa. Pet. 88–90. Moreover, it is clear that Patent Owner understood that the proposed ground offered in the Petition considered the disclosure of Mendelson-799, and Patent Owner had opportunity to address that disclosure. Indeed, Patent Owner availed itself of that opportunity during trial (*see, e.g.*, PO Resp. 53; PO Sur-reply 21).

We further find unavailing Patent Owner's argument that "Mendelson[-799] does not disclose a cover (or even epoxy encapsulation)

and thus cannot disclose a circular housing and a cover of the circular housing, as claim 26 requires." PO Resp. 53. Figure 7 of Mendelson-799 is reproduced below:

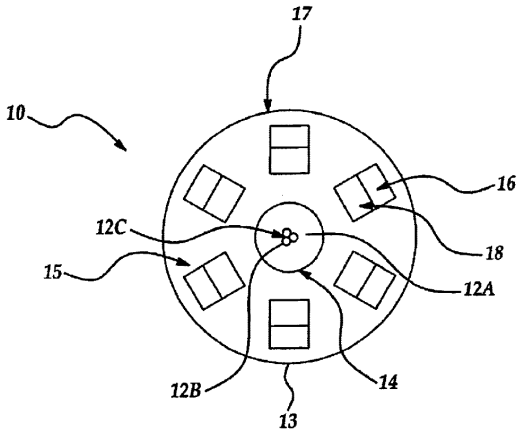


Figure 7

Figure 7 is a top view of optical sensor 10 comprising light source 12 composed of three LEDs 12A, 12B, and 12C emitting light of three different wavelengths, and an array of six near detectors 18 and six far detectors 16 "arranged in two concentric ring-like arrangements" surrounding light source 12. Ex. 1025, 9:23–34. "All these elements are accommodated in a sensor housing 17" which, as can be seen in Figure 7, is clearly circular. *Id.* at 9:34–35. Patent Owner does not articulate why the presence or absence of a cover in Mendelson-799 somehow serves to discount the unambiguous presentation of a sensor housing having a circular shape.

Furthermore, one of ordinary skill in the art would have understood that the AIRPAX package of Mendelson-1988 and the housing 17 of Mendelson-799 are performing the same function of enclosing a central collection of light emitters which are surrounded by an array of light detectors in an optical sensor attached to a user's body. *See, e.g.*, Ex. 1015, Figs. 2A–2B; Ex. 1025, Fig. 7. The evidence of record also does not suggest that the shape of such a housing has any functional significance in the

operation of the optical sensor, or that any particular shape was preferred or restricted. Thus, the evidence suggests that a square shape and a circular shape of such a housing were known in the art to be predictable substitutes for one another, and therefore obvious variants. *See, e.g.*, *KSR*, 550 U.S. at 416 ("[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result."); *id.* at 417 ("[W]hen a patent 'simply arranges old elements with each performing the same function it had been known to perform' and yields no more than one would expect from such an arrangement, the combination is obvious." (citation omitted)).

For the foregoing reasons, we determine that Petitioner has met its burden of demonstrating by a preponderance of the evidence that claim 26 would have been obvious over the cited combination of references.

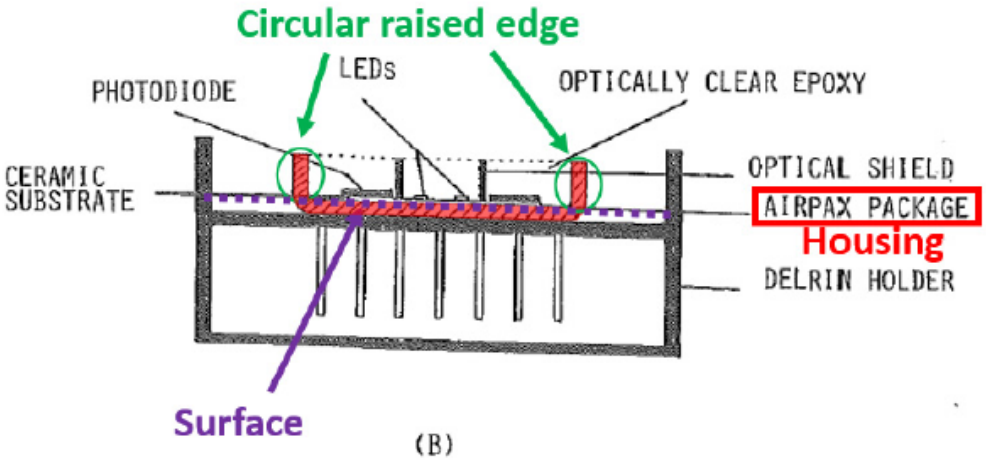
4. Dependent Claims 2–14, 16–22, and 27–30

i. Dependent Claim 3

Dependent claim 3 recites that "the circular raised edge creates a gap between the surface and the light permeable cover." Ex. 1001, 44:58–60.

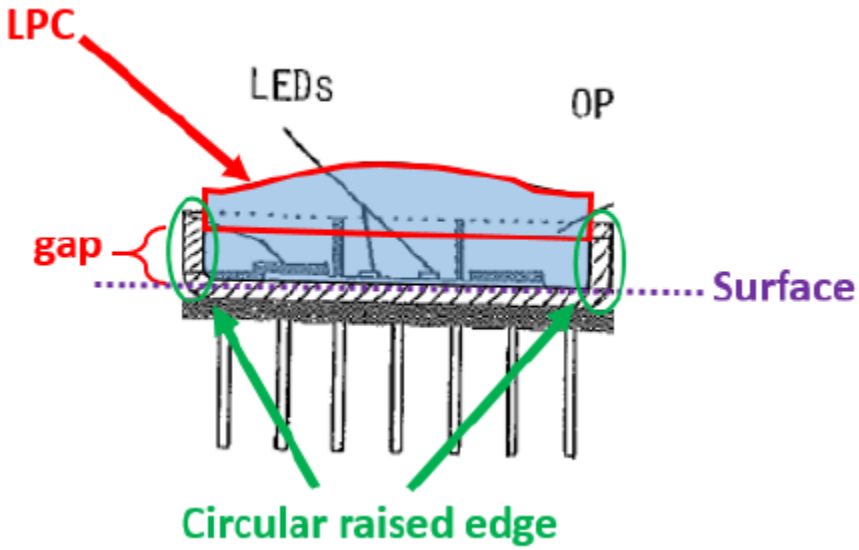
For this claim, Petitioner relies upon a different mapping of the "circular raised edge" than that primarily relied upon in claim 1. *See supra* § II.J.2.iii, n.8 (identifying, but not relying upon, Petitioner's alternate mapping). Specifically, Petitioner contends that although Mendelson-1988's sensor presents a square shape, it would have been obvious to a skilled artisan that a circular shape, and circular raised edge, could have been used. Pet. 71; *see also supra* § II.J.3 (similar arguments regarding claim 26).

Petitioner presents an annotated version of Mendelson-1988's Figure 2(B) below.



The annotated figure identifies an outer edge of Mendelson-1988's AIRPAX package with the label "Circular raised edge." Pet. 71; Ex. 1003 ¶ 160.

Regarding claim 3, Petitioner contends that, in the modified sensor of Mendelson-1988 and Inokawa, "the [light permeable cover] portion is separated from the surface by a gap," as shown below. Pet. 76.



The annotated and modified figure above presents Mendelson-1988's sensor with the epoxy formed to extend from the bottom surface upward through a protruding cover, and with a line identifying the upper portion of the epoxy

that Petitioner contends is the light permeable cover. Thus, according to Petitioner, "[t]he size of the gap above is defined, in part, by the raised edge of the housing, which as described above for [1b] can be circular, that surrounds the epoxy structure and serves as a mold that define its overall height (and thus the size of the gap)." Pet. 77 (citing Ex. 1023 ¶¶ 34–38, Figs. 5–6; Ex. 1003 ¶¶ 178–179).

In response, Patent Owner argues that "drawing an arbitrary line through an undifferentiated mass of material does not create a 'gap,'" and characterizes Petitioner's alternate mappings as ambiguous. PO Resp. 49 (citing Ex. 2004 ¶¶ 108–109; Ex. 2007, 355:12–359:5). Patent Owner argues that the term "gap" requires some kind of "break," which is absent in the proposed combination. *Id.* (citing Ex. 1001, 36:24–28; Ex. 1017; Ex. 2004 ¶ 110). Moreover, Patent Owner argues that in this mapping, it is not the circular raised edge that "creates" the gap, as claimed. *Id.* at 51.

In its Reply, Petitioner contends that "the 'line' between the LPC/cover and the epoxy encapsulation layer underneath is not arbitrary, instead being formed, for instance, by a common manufacturing technique for creating epoxy lenses in which the epoxy lens layer is provided on top of a separately formed epoxy encapsulation layer." Pet. Reply 23–24 (citing Ex. 1003 ¶¶ 178–179; Ex. 1047 ¶ 49).

In its Sur-reply, Patent Owner argues that Petitioner's reliance on Nishikawa for teachings of how to manufacture separate epoxy layers is unavailing because Nishikawa's process seeks to avoid any gaps in the epoxy. PO Sur-reply 21 (citing Pet. 67).

Upon review of the foregoing, we conclude Petitioner's case for the obviousness of claim 3 falls short. Petitioner's identification of the bottom

border of the LPC "cover" in this mapping is arbitrary, and is not supported by a preponderance of the evidence. Dr. Kenny does not provide any persuasive reasoning in support of his identification of the "cover" as terminating at the bottom border he has identified, when the same mass of epoxy extends further beyond that border to the surface of the sensor. *See* Ex. 1003 ¶¶ 90–91. We perceive no such reasoning, apart from impermissible hindsight.

Dr. Kenny testifies that "the height of the 'circular wall' in Mendelson-1988 necessarily impacts the position of the LPC (cover), in turn necessarily impacting the size of the 'gap' between the cover and the surface," and, as such, the "line" between the cover and epoxy underneath is not arbitrary. Ex. 1047 ¶ 49; *see also* Ex. 1003 ¶ 90. Instead, Dr. Kenny asserts, this represents a common manufacturing technique to form separate layers of epoxy, for example, as taught by Nishikawa. Ex. 1047 ¶ 49 (citing Ex. 1023 ¶¶ 34–38, Figs. 5–6).

But we find this testimony deficient in two primary ways. First, Dr. Kenny's reliance on Nishikawa is misplaced. Dr. Kenny relies on Nishikawa's disclosure that sealing portion 40 and lens unit 50 may be formed in separate injection molding steps, leading to a defined border between them which is shown as a horizontal line in Nishikawa's Figure 6. Ex. 1023 ¶¶ 34–35. Thus, Nishikawa *does* establish, as Dr. Kenny testifies, that Mendelson-1988's epoxy layer *could* have been formed in a two-step injection molding process, leading to a border between two layers of epoxy. However, Dr. Kenny errs in "focus[ing] on what a skilled artisan would have been *able* to do, rather than what a skilled artisan would have been *motivated* to do." *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056,

1068–69 (Fed. Cir. 2018) (citing *InTouch Techs., Inc. v. VGO Commc'ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014)). Dr. Kenny does not provide any persuasive motivation for using Nishikawa's two-step molding process within the context of Mendelson-1988's sensor. Thus, we conclude Dr. Kenny "succumbed to hindsight bias in [his] obviousness analysis." *InTouch*, 751 F.3d at 1352.

Second, Dr. Kenny's testimony that the height of the circular wall impacts the position of the cover is belied by Dr. Kenny's illustration of the proposed modification in which the "line" dividing the cover from the epoxy is located *below* the full height of the circular wall. *See* Ex. 1047 ¶ 48. Thus, in no way does the AIRPAX package wall create the gap. Instead, the identified "gap" (to the extent it can be named as such) is created by the height of the lower layer of epoxy purportedly laid down in Nishikawa's first injection molding step.

For the foregoing reasons, we conclude Petitioner has not demonstrated by a preponderance of the evidence that claim 3 is unpatentable over Mendelson-1988 and Inokawa. Dependent claims 6–14 and 16 depend further from claim 3 and, as such, Petitioner's contentions with respect to those claims also fail.

ii. Dependent Claim 5

Petitioner identifies dependent claim 5 as being challenged in its proposed ground of unpatentability based on Mendelson-1988 and Inokawa. *See* Pet. 2 (listing claims 1–14, 16–22, and 26–30 as part of this ground), 62 (heading identifying the same challenged claims). But, Petitioner does not present any contentions addressing the specific limitations of claim 5. *See*

id. at 75–94 (purportedly addressing all challenged claims beyond claim 1). As such, Petitioner has not met its burden.

iii. Dependent Claims 2, 4, 17–22, and 27–30

Petitioner presents undisputed contentions that claims 2, 4, 17–22, and 27–30, which depend directly or indirectly from independent claim 1 or 26, are unpatentable over the combined teachings of Mendelson-1988 and Inokawa, and provides arguments explaining how the references teach the limitations of these claims. Pet. 75–78, 84–87, 91–94; Ex. 1003 ¶¶ 174–175, 180, 198–203, 213–219.

Patent Owner does not present any arguments for these claims other than those we have already considered with respect to independent claims 1 and 26. PO Resp. 57 ("The Petition fails to establish that independent claims 1 and 26 are obvious over the cited references of Ground 2A and therefore fails to establish obviousness of any of the challenged dependent claims.").

We have considered the evidence and arguments of record and determine that Petitioner has demonstrated by a preponderance of the evidence that claims 2, 4, 17–22, and 27–30 would have been obvious over the combined teachings of the cited references and as supported by the testimony of Dr. Kenny.

K. Obviousness over the Combined Teachings of Mendelson-1988, Inokawa, and Mendelson-2006

With support from the testimony of Dr. Kenny, Petitioner contends that claims 23 and 24 would have been obvious over the combined teachings of Mendelson-1988, Inokawa, and Mendelson-2006. Pet. 94–97 (citing

Ex. 1003 ¶¶ 220–224; Ex. 1008 ¶ 56; Ex. 1015, 167, 171, Fig. 2; Ex. 1016, 912–915, Figs. 1–3; Ex. 1022). For instance, Petitioner applies the teachings of Mendelson-2006 to account for the mobile monitoring device features required by claim 23 and the touch-screen display recited in claim 24. *Id.*

Patent Owner does not separately address this ground, urging only that the ground "do[es] not fix the Petition's deficiencies" alleged in connection with the ground based on Mendelson-1988 and Inokawa. PO Resp. 57. As discussed above, we do not agree with Patent Owner as to any such deficiencies. *See supra* § II.J.

We have reviewed the Petition and its supporting evidence and conclude that Petitioner has shown by a preponderance of the evidence that claims 23 and 24 are unpatentable based on Mendelson-1988, Inokawa, and Mendelson-2006.

L. Obviousness over the Combined Teachings of Mendelson-1988, Inokawa, Mendelson-2006, and Beyer

With support from the testimony of Dr. Kenny, Petitioner contends that claim 25 would have been obvious over the combined teachings of Mendelson-1988, Inokawa, Mendelson-2006, and Beyer. Pet. 97–99 (citing, e.g., Ex. 1003 ¶¶ 224–231; Ex. 1016, 913–914; Ex. 1019, 1:6–15, Fig. 1). For instance, Petitioner applies the teachings of Beyer to account for the processor features required by claim 25. *Id.*

Patent Owner does not separately address this ground, urging only that the ground "do[es] not fix the Petition's deficiencies" alleged in connection with the ground based on Mendelson-1988 and Inokawa. PO Resp. 57. As discussed above, we do not agree with Patent Owner as to any such deficiencies. *See supra* § II.J.

We have reviewed the Petition and its supporting evidence and conclude that Petitioner has shown by a preponderance of the evidence that claim 25 is unpatentable based on Mendelson-1988, Inokawa, Mendelson-2006, and Beyer.

III. CONCLUSION

In summary:[10]

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–14, 16, 17, 19–23, 26–29	103	Aizawa, Inokawa	1–14, 16, 17, 19–23, 26–29	5
23, 24	103	Aizawa, Inokawa, Mendelson-2006	23, 24	
25	103	Aizawa, Inokawa, Mendelson-2006, Beyer	25	
5	103	Aizawa, Inokawa, Al-Ali	5	

[10] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

23–25	103[11]	Aizawa, Inokawa, Goldsmith, Lo		
1–14, 16, 17, 19–23, 26–29	103[12]	Aizawa, Inokawa, Ohsaki		
1–14, 16–22, 26–30	103	Mendelson-1988, Inokawa	1, 2, 4, 5, 17–22, 26–30	3, 5–14, 16
23, 24	103	Mendelson-1988, Inokawa, Mendelson-2006	23, 24	
25	103	Mendelson-1988, Inokawa, Mendelson-2006, Beyer	25	
Overall Outcome			1–14, 16–30	

IV. ORDER

Upon consideration of the record before us, it is:

ORDERED that claims 1–14 and 16–30 of the '190 patent have been shown to be unpatentable; and

[11] As explained above, because we conclude that the challenged claims are unpatentable on other grounds, we do not reach the merits of this ground.

[13] As explained above, because we conclude that the challenged claims are unpatentable on other grounds, we do not reach the merits of this ground.

FURTHER ORDERED that, because this is a final written decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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IPR2021-00195 – Patent 10,376,190
Apple v. Masimo

CERTIFICATE OF SERVICE

I hereby certify that the original of this Notice of Appeal was filed via U.S.P.S. Priority Mail Express on July 27, 2022 with the Director of the United States Patent and Trademark Office at the address below:

Office of the Solicitor
United States Patent and Trademark Office
Mail Stop 8, P.O. Box 1450
Alexandria, Virginia 22313-1450

A copy of this Notice of Appeal is being filed and served on July 27, 2022 as follows:

To the USPTO Patent Trial and Appeal Board:
Patent Trial and Appeal Board
Madison Building East
600 Dulany Street
Alexandria, VA 22313

(*via PTABe2e – as authorized by the Board*)

To the U.S. Court of Appeals for the Federal Circuit:
Clerk of Court
U.S. Court of Appeals for the Federal Circuit
717 Madison Place, N.W.
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(*via CM/ECF – with filing fee*)

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